A Surgeon's Diary
of
A Visit To China

Michael E. DeBakey, M.D.

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This diary by Dr. Michael DeBakey, America's great heart surgeon, is published by Phoenix Newspapers, Inc. in behalf of a better understanding and working partnership between Chinese and Western medicine.

PREFACE

For an entire generation, from 1949 until 1972, relations between the most populous and richest nations of this planet could be likened to an open cut that refused to heal. The gash seemed to be continually opening up, and every so often it became infected and then rather inflamed. The patient seemed to lack the will to heal, in addition to there being other complications.

Ping-Pong signaled the reversal of the patient's condition. The will to heal returned and the capillaries started to mend this open wound.

The China America Relations Society was established to assist in facilitating that healing function. The most appropriate field in which there exists a common language is that of medicine and public health. The Society was very proud to have had such a distinguished world-renowned American surgeon, Dr. Michael E. DeBakey, lead to the People's Republic of China in February and March, 1973, a Society-sponsored delegation in the field of health care. During their one-month stay in China, the group was the guest of the China Medical Association.

The China Diary, in which Dr. DeBakey has recorded his many impressions and analyses about China's delivery of health care to the people, offers unique insight by a distinguished man of medicine.

What we read about in newspapers and popular journals, Dr. DeBakey has now illuminated from the standpoint of a doctor with vast world-wide experience who is eminently qualified to make the kind of comparisons he does in this Diary.

Dr. DeBakey's short volume adds a great deal to our understanding of Chinese life today, especially as it has to do with the delivery of that vital human service — health care.

THOMAS B. MANTON
President
China America Relations Society

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FOREWORD

A Trip Delayed Ten Years

Michael DeBakey's China Diary has a certain unreal quality. Through the time compression of jet travel, this remarkably experienced American surgeon is suddenly immersed in a Chinese world. His attuned eyes and ears, with essentially no time for adjustment or conditioning, act as superb data collectors and the reader has the privilege of enjoying a master surgeon's observations. But Mike DeBakey is also a sensitive international citizen, a combination of a Yankee in King Arthur's Court and an airborne Marco Polo. His comments on the whole fabric of New China present the opinion of a mature, unbiased citizen. We Americans too long ignored such information about modern China. The screen of our own bias is lifted a few significant inches by DeBakey's apolitical, accurate words.

The pages that follow are his Chinese memoir, describing observations made in 1973. This diary almost was written ten years ago. One evening in Peking, I was visiting with the chief surgeon of the Chinese heart hospital, Dr. Wu Ying k'ai. Dr. Wu and I were discussing American surgeons who might be invited to China. I suggested DeBakey and Wu replied, "Of course, he will be first. We almost had him here ten years ago but something came up. We have a great deal of respect for him."

Thus as relationships between the United States and China began to improve, Michael DeBakey was one of the very first visitors. His China Diary is an important documentary.

E. Grey Dimond

INTRODUCTION

The China-America Relations Society was founded in March, 1972, "To promote understanding between the people of the United States and the People's Republic of China," and "To increase knowledge of China and U.S.-China relations within the United States." Toward these objectives and with the full cooperation of responsible Chinese officials, the China-America Relations Society has sponsored several tours of one to two or three weeks' duration for specialized groups of Americans in vocational, professional, and educational areas of endeavor.

Accordingly, arrangements were made by the Society to sponsor their first health group tour as guests of the China Medical Association and Ministry of Health. Dr. Thomas B. Manton, President of the Society, invited me to be the Chairman of this health group.

This was a long-awaited opportunity to visit China. I had previously received two official invitations along with visas to visit China, the first being in 1961, during a visit in India as Visiting Professor at King Edwards Hospital in Bombay, and the other, the next year. At that time, however, the policy of our State Department would not allow me to accept the invitation, despite my efforts to persuade them to let me make the trip. It was, therefore, with eager anticipation that I accepted this invitation from Dr. Manton to head this health group visit.

In the following account of our visit I have attempted to report some impressions and observations on the status of health care in China. In addition I have made some commentaries on various specialized aspects of health care systems, including organization and education. Obviously, in such a short visit it is not possible to develop a comprehensive and authoritative understanding of all aspects of the medical status and health care system of the country. Nonetheless, one can get some impressions, and this report must be read with this limitation in mind.

I should like to acknowledge with gratitude some of the photographs used, which were made by Dr. Frederick C. Holschuh, who kindly arranged for me to include them in this account.

A Visit To China

Monday, February 12, 1973

I left Houston on Delta Airlines flight 270 and arrived at Kennedy Airport on schedule at 12:04 p.m. I was met by a limousine and joined by Sister Irene Munoz. We were then driven to Tarrytown Conference Center — about a 45-minute drive.

At 2:30 we had an orientation conference with Dr. Tom Manton, Shelly Corson, and the Health-Care group making the trip including:

Harry Becker — Vice Chairman and Secretary of the Delegation
Professor of Community Medicine
Albert Einstein College of Medicine
New York, New York

Alton Blakeslee — Science and Medicine Editor
The Associated Press
New York, New York

General William Draper — Chairman
Population Crisis Committee
Washington, D.C.

H. Jack Geiger, M.D. — Visiting Professor of Medicine
Harvard Medical School
Cambridge, Massachusetts

Nancy Hicks — Health Writer
New York Times
New York, New York

Frederic Holschuh, M.D. — Partner
Hawaii Emergency Physicians Associated
Honolulu, Hawaii

Sister Irene Munoz, R.N. — Director
Muscatine Migrant Health Program
Muscatine, Iowa

Lillian Roberts — Assistant Director
District Council 37
State and County Municipal Workers Union
New York, New York

Ernest Saward, M.D. — Associate Dean of Extramural Affairs and
Professor of Social Medicine and Professor of Medicine
University of Rochester
School of Medicine and Dentistry
Rochester, New York

Mitchell Spellman, M.D. — Dean
The Charles R. Drew Postgraduate Center
Los Angeles, California

Later Professor Ernst F. Winter, a political scientist, joined us and gave a most interesting and informative discussion of the development and current status of the Chinese medical organization personnel and functions.

Dr. Manton briefly described the organization and purpose of the China-America Relations Society — a private voluntary organization — and indicated that we were the first American medical group sponsored by the Society and invited by the China Medical Association. For this reason, our project had much significance so far as future developments were concerned. I was appointed as Chairman of our group and Dr. Harry Becker as Vice-Chairman and Secretary.

After dinner Professor Winter discussed in more detail the organization of health activities in China and presented a most interesting account of the historical development and political philosophy underlying the difference in approach between the Chinese and Russian governments.

Tuesday, February 13

We left Tarrytown Conference Center shortly after 7:00 a.m. and arrived at Pan American building at Kennedy Airport, where we were met by Mr. Maurice Saklud, who facilitated our luggage check. We then boarded Pan American flight 100, a 747 plane, and left Kennedy Airport a little after 10:00 a.m. The flight to London was uneventful, and we arrived on schedule at 9:40 p.m. We were then taken by bus to the Sheraton Heathrow Hotel, where we were kindly greeted by the manager. It is a new hotel (having opened only two weeks before) — modern and attractively appointed with comfortable rooms.

Wednesday, February 14

After a good night's rest we left the hotel by bus at 7:00 a.m. for the airport, where we were met by special representatives of Pan American Airlines, who were expecting us. We then boarded Pan American flight 2 (a 747 plane) and left London at 8:00 a.m. on our way to Karachi, making stops at Istanbul and Beirut. We arrived at Karachi at 2:20 a.m. (Thursday). Here again, we were met by representatives of Pan American and Pakistani Airlines, who were most gracious. They took us to a nearby hotel, where we were able to bathe and change clothes before returning to the airport.

Thursday, February 15

At 5:30 a.m. we left Karachi on Pakistani Airlines flight 750 (a 720b plane). There were only a few passengers, about one-third of the plane's capactiy. The flight to Peking was relatively uneventful, requiring about six hours with one stop at Islamblad. The scenery over the rugged, snow-capped mountains between China and Pakistan was picturesque. We then flew over an expansive desert before arriving in Peking on schedule at 4:30 p.m. where we were met by a large delegation of the China Medical Association, the Ministry of Health, and the Ministry of Foreign Affairs, including my old friend, Dr. Wu Ying Kai, along with several interpreters. They took our passports and luggage checks and facilitated our passage through customs, and then took us in a bus to the Min Zu Hotel (meaning Nationalities Hotel).

The road leading from the airport was an attractive, tree-lined avenue, and as we continued through the countryside to Peking, we could see fields being prepared for spring planting, despite the fact that it was still winter there with the temperature a few degrees below zero and some residual snow on the ground. As we began to enter the peripheral

margins of the city, we could see some factories and housing developments in the form of apartments, which architecturally seemed rather drab. Finally, after entering the city, we turned onto the main city 10-lane boulevard, which extends for more than 20 miles from one end to the other. We drove past the great railroad station, the Great Hall of the People with the large square in front of it where public ceremonies are often held, the official office of Chairman Mao Tse-tung, the classic beauty of the Imperial Palace and Forbidden City and the old Peking Hotel, and then to the Min Zu Hotel. Beside the Peking Hotel was a large excavated area, in preparation for a large, 20-story addition. At present Peking has a shortage of hotels, which makes it difficult to accommodate tourists. There is also some shortage of interpreters. The impression was gained, however, that efforts are now underway to construct more hotels and later to develop the tourist industry.

We arrived at our hotel and were comfortably ensconced in our rooms. Although not luxurious, the hotel is reasonably modern, having been built in 1959. It has two dining rooms on the first floor, one for Western food and the other for Chinese food. We usually had breakfast in the former and lunch in the latter. Dr. Becker and I, as Vice-Chairman and Chairman, respectively, of our group, were given rooms with a large sitting room between our bedrooms. Chinese cigarettes and matches were placed in all of our rooms, but the most delightful touch of hospitality was the presence of a huge thermos bottle (about 1/2 gallon in size) filled with steaming hot water that remained hot for 24 hours and a large package of Chinese tea and a covered drinking cup, providing the opportunity to make your own hot tea any time of the day or night. The thermos bottles were changed daily. Bottled drinking water was also provided. Another gesture of their gracious hospitality was the provision of an electric plug to fit the electric outlets in the room for my electric razor. None of the various European connections I had would fit the outlets. (Incidentally, their voltage was 220 but with a converter I was able to use my electric razor.)

After unpacking and a refreshing bath, we had dinner, and everyone except Dr. Becker and I retired early, being exhausted from the long trip. Dr. Becker and I met with the representatives of the China Medical Association, who described the schedule of activities they had planned for the next three weeks, with visits to six cities. The schedule seemed to us to be most interesting. They also invited me to give a lecture on cardiovascular surgery on the following Monday evening.

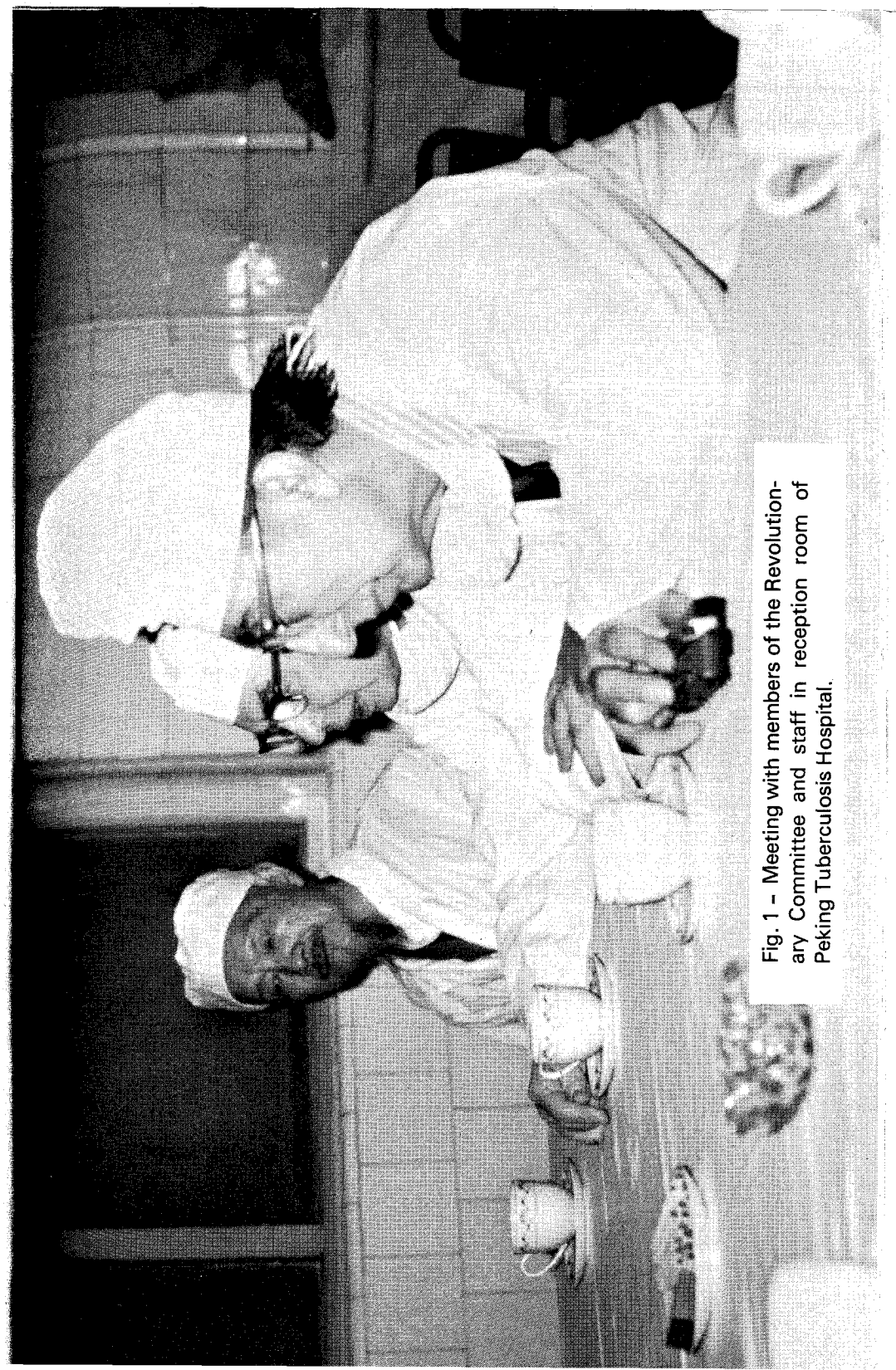

Fig. 1 - Meeting with members of the Revolutionary Committee and staff in reception room of Peking Tuberculosis Hospital.

Friday, February 16

After breakfast we left by bus to visit the Peking Tuberculosis Institute, which is located just outside the city about thirty minutes from our hotel. There, we were met by the Director, Dr. Ho-Mou, Chairman of the Revolutionary Committee, along with other members of the Committee and staff. We were seated in a sort of reception room (Fig. 1) around a large table and given a warm, friendly greeting and hot tea. (This is a hospitable custom we were to encounter repeatedly, with our cups being constantly refilled by young girls with smiling faces). We were told that we would witness an operation which would be performed under acupuncture anesthesia. The hospital had 400 beds devoted entirely to patients with tuberculosis and was staffed by about 400 physicians, nurses, and attendants. This was the main hospital for the more difficult and refractory cases. Dr. Ho-Mou stated that since 1965 they had performed about 1,600 operations, that acupuncture anesthesia had been used in about 30 per cent of the cases, and that it had been found successful in about 90 per cent. Some patients, he said, refused this type of anesthesia; others were unsuitable because of their excitable nature, or because of excessive secretions.

Acupuncture in Surgery

We were then taken to the operating room after donning white coats (over our clothes), cap and mask, and slippers after removing our shoes. In the operating room, the patient, a 26-year-old man, was lying on the table in the supine position with the left arm supported above the head by a sling attached to a right angle support attached to the table. He was fully conscious and alert. He had been premedicated with atropine and morphine. The anesthesiologist, sitting at the head of the table, administered 10 mg of morphine just behind and below the left ear. (This is considered one of the acupuncture points.) The primary acupuncture point for anesthesia was about midway on the dorsum of the left arm. This was performed by the acupuncturist, Liu Shu-chi, a young woman trained in this procedure with about six years experience in acupuncture. The needle itself was about 5 inches long, comparable to one of our 20-gauge needles, with a round, knurled covering over all but about an inch of the needle from the point. After inserting the needle through the skin for about 2 cm, she continuously twirled the needle with her fingers

with a to-and-fro and an up-and-down motion throughout most of the operation, which lasted about two hours. About fifteen minutes after insertion of the needle, the operative field was prepared with iodine and drapes were applied; the surgeon, Dr. Hsin Yu-Ling, made the incision in the chest using an anterior right thoracotomy over the third interspace. I watched the patient's face as the incision was being made, and he did not flinch or show any evidence that he felt any pain. Indeed, the only time he showed any evidence of pain was when the incision was closed and when incisions were made in the skin for insertion of the two intercostal chest tubes. On several occasions the anesthesiologist allowed the patient to have a swallow of tea and to chew a piece of orange. The surgeon performed left upper lobectomy by individual dissection, ligation, and division of the pulmonary arteries and veins and division and suture of the bronchus with interrupted silk sutures. Silk was used throughout the operation. The patient did not require ventilatory assistance during the operation and showed no evidence of anoxia. Early in the procedure, during dissection of the hilum, the patient began to strain and cough, and the surgeon infiltrated the mediastinum and hilar area with a local anesthestic. After completion of the lobectomy, the surgeon poured fluid into the pleural cavity, and the anesthesiologist placed a mask over the patient's face and produced forced ventilation in order to observe whether there was any leakage at the bronchial stump. After the bandage was applied to the skin incision, the patient sat up on the table, shook hands with us and smiled, and was moved off the table.

During the operation the blood pressure remained stable at about 120 to 140 mm Hg systolic and 80 to 90 mm Hg diastolic. The pulse rate gradually increased from about 80 to 120 per minute. He received no blood during the operation, and we were told that blood transfusion is rarely necessary although it is sometimes given after operation. Only one intravenous needle was inserted in a vein of the foot, through which about 500 cc of saline solution was given. Blood pressure was determined by means of a blood pressure cuff. The room contained no electronic monitoring equipment, and no attempt was made to obtain blood for blood gas and electrolyte study. Everything about the operation and the operating room reflected stark simplicity with the exception of a TV camera, which showed the operation. There was little else in the operating room besides the table, a Bovie cautery unit, and the surgical instrument tray, which contained a minimal number of instruments. The overhead light was of the old German design with multiple beams requiring someone to adjust it. On one wall were x-ray view-boxes with the roentgenograms of the chest and bronchogram showing the tuberculous cavity in the left upper lobe.

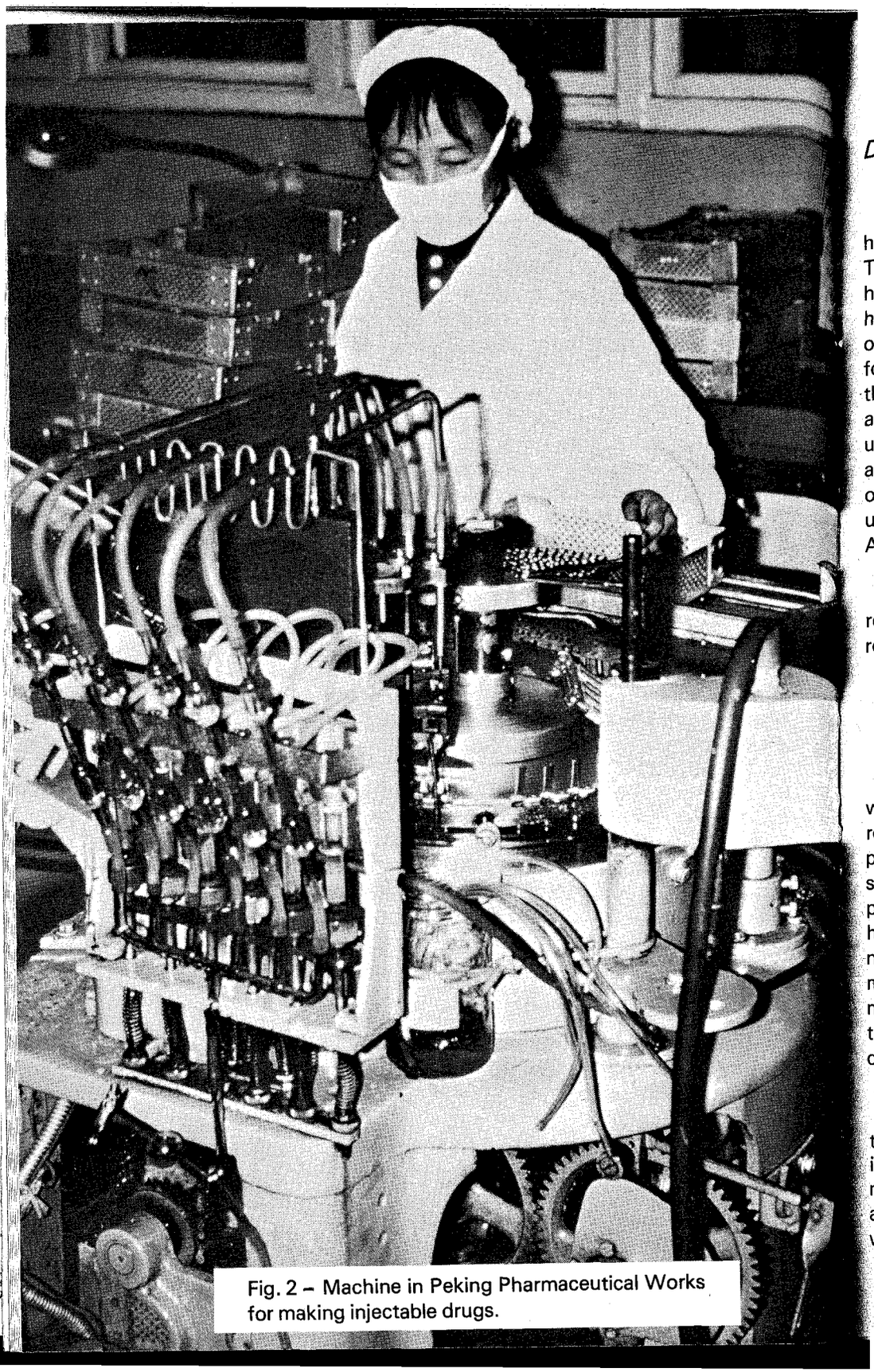

Fig. 2 – Machine in Peking Pharmaceutical Works for making injectable drugs.

We then had tea in a small conference room with the Director of the hospital, the surgeon, the acupuncturist, and some other staff members. They were forthright in answering our questions. They told us that they had done research on acupuncture for surgical anesthesia since 1965 and had reduced the number of needles used from 40 to 1. When operating on the right side of the chest, they use the same puncture point in the forearm on the right side. It had been found useful in about 30 per cent of the cases and, for various reasons, it was necessary to use general anesthesia in the other 70 per cent. They were unable to explain the underlying anatomic and physiologic basis for its efficacy in producing anesthesia but were doing research on this matter and were rather vague on the research approach. They were most gracious and friendly and told us as we departed that they were happy and honored to have us as American friends to visit their hospital.

We then drove back to the hotel and had lunch in the Chinese dining room. We had breakfasted that morning in the Western-food dining room with the typical fried eggs, bacon, toast, and coffee or tea.

Drug Making

After lunch we were taken to the Peking Pharmaceutical Works, which was in an old brick building and which had been taken over after the revolution. We were told that before the revolution it was a private pharmaceutical company that employed about 140 people, but it had since been expanded greatly and now employed 4,600 workers. It now produces more than 300 pharmaceuticals, including antibiotics, hormones, and various types of therapeutic drugs, mostly of a chemical nature. Biologic drugs are made elsewhere. It manufactures mostly modern medical drugs, but they were doing some research on traditional medicinal agents. They said that this was rather difficult because traditional medicinal agents often consist of various concoctions, some of which may be made from 40 or more herbs and other material.

We then toured the plant and saw the machinery used to produce tablets and vials of various drugs for intravenous or subcutaneous injections. The equipment and machinery (Fig. 2) we saw were fairly modern and similar to those used in our own pharmaceutical plants, although they were not computerized, being supervised by individual workers. In addition to this main plant, there were four other branch

plants that were coordinated with this plant to produce all the pharmaceuticals for this region. They have their own research and development section and conduct their own testing of new drugs for toxicity and efficacy. They stated that it takes from two to three years before a new drug is available for clinical use. They are familiar with new drugs developed in other countries and always test them themselves before making them available for clinical use. They pointed out that they have sometimes found that the claims made for some new drugs developed in other countries have not been proved to be valid. The drugs are made available to the people through drug stores and hospitals and by prescription from a physician. Most drugs can be bought directly by the people from a drug store, but if gotten by a prescription from a physician, it can be obtained free by a worker. A worker pays half the price for his dependents. If the worker is unable to pay for the drugs for his dependents, he can still obtain them through a subsidy from the welfare fund. Apparently, the cost of drugs is quite reasonable, and drugs are easily obtained by the public.

We then returned to the hotel, where we had dinner in the Chinese dining room and then were taken to witness a Ping Pong match between a Cuban and a Chinese team (their second team — naturally they won).

Saturday, February 17

In the morning we went to the Chi Sheui Tan Hospital, which is a general hospital, but the emphasis is on trauma. It is a 520-bed hospital built about 20 years ago with additions built periodically during that time. The grounds originally housed the home of a Chinese lord and were taken over after the revolution — there are still some remnants of the original construction with several temples and tea houses built in the old Chinese architectural style. These are used for various purposes, such as rehabilitation for the patients. The total personnel of the hospital numbers 520 (a staff-to-patient ratio of 1 to 1 — which seems to be a general rule here). Most wards contain 4 and 6 beds; they are well kept and clean, but here again there is stark simplicity.

Medical Rounds

We made ward rounds, going first to the orthopedic service where several typical patients were presented. These included a young girl who had a fracture of the midfemur, treated by use of an intramedullary nail

and another young girl with a comminuted fracture of the midfemur, treated by traction using a Kirschner wire with splints around the thigh held in place with tape (we were told that this was an example of the combined use of traditional medicine and modern medicine). This seemed a rather strained effort to include the practice of traditional medicine. It was the only example of traditional medicine that we saw except for the next case. The patient was a 75-year-old man with a fracture of the hip in which a Smith-Petersen nail was used, and we were told that this had been done under acupuncture anesthesia. In most of the other cases of fracture, as well as other orthopedic procedures, a general or extradural anesthetic was used. The next patient was a young man about 30 years old with rheumatoid arthritis, who was treated by replacement of the lower half of the knee joint with a homograft. They told us that this was an experimental procedure, and they did not know what the long-term results would be. This was rather startling, since I had never heard of this type of treatment. The next two cases were a young girl with a giant cell bone tumor of one of the lumbar vertebrae treated by resection and replacement with a bone transplant-homograft and another patient with a giant cell bone tumor of the tibia at the knee joint treated by resection and bone transplants. The last case was a man about 45 years old with arthritis of the hip treated by an artificial hip replacement using titanium hip ball prosthesis. It was an impressive display of orthopedic surgery with all the patients seemingly doing well — at least during this early postoperative period.

The next service we visited was the Hand and Foot Surgery and Extremity Replacement Service. We saw several relatively young patients in the third and fourth decades of life, who had had re-implantation of the upper limb after complete transection at various levels in the forearm one or two years earlier. (In the movie we were shown later we saw one patient with complete transection high in the upper arm and another with autotransplantation of the right foot at the level of the upper ankle to the left side in which the right leg had to be amputated afer a crushing injury of both legs.) All the patients we saw were certainly doing well and could use the re-implanted limb with some degree of function in the hand. The fingers could be flexed and extended partially, and there was return of some sensation. A few required additional surgical procedures to release adhesions about the tendons. In general, the results were indeed impressive. They were quite modest about the results, stating that of the 40 patients they had treated, some degree of success had been obtained in 27, with sufficient return of function to permit some of them to resume work. It was obvious that

they have made a special effort to develop this surgical procedure and had achieved an appreciable measure of success.

We then were shown the Burn Service, which is another specialty of this hospital. Apparently several methods of treatment are used. The early treatment is fairly standardized and comparable to that used in our country, but the subsequent treatment varies. In a child suffering with an 80 per cent, mostly second degree, burn they were using a conservative method with complete pressure dressings. They stated that the patient was still in critical condition. In another case we were shown, a man about 35 years of age with a 70 per cent second and third degree burn, they had used radical excision. When we saw him, six weeks after operation, he was doing well. The method they used in this case is radical excision of the burned area in several stages, with homograft covering of the denuded area and with small, split-thickness, patch grafts taken from the patient and placed in multiple small openings made in the sheet of the homograft covering. The results of all methods of treatment used were modestly presented and seemed little different from those reported in our country.

The general impression obtained was highly satisfactory, with an honest, forthright presentation of their work. They were obviously doing excellent work of a high quality comparable with the best anywhere. They were using the most modern developments including the most modern antibiotics, such as Kanamycin, Staphcillin, and penicillin. We left with the impression that the trauma service in this hospital could compare favorably with the best any place in the world. The surgeons were highly qualified, well trained, and dedicated.

Time Out

In the afternoon we were taken to a glass factory, which originally was a private concern with about 120 employees, but after the revolution it was taken over by the state and greatly expanded to about 4,600 employees. We saw the actual forging and manufacture of the glass in different colors and then the production by handcraft of some 600 different items, such as animals, birds, flowers, shrubs, and trees. They told us it takes about three years to train the workers (many of whom were young girls) to make these beautiful glass productions. Most of their production is for export.

Afterward we were taken to the Friendship House to do some shopping. This is a department store for foreigners and includes clothing, jewelry, and other items. We saw their display of jade, which we found extremely expensive and not of high quality. Indeed, all of the items seemed very expensive and we did very little shopping.

In the evening a special dinner was given for us at the Peking Duck Restaurant — the restaurant which has made Peking duck so famous. It is now 109 years old. This is where President and Mrs. Richard Nixon had dinner. We were hosted by Dr. Hsieh Hua, who is the leading member of the Chinese Medical Association and about 20 of his colleagues from the China Medical Association. Naturally we had Peking duck served in about 20 different ways, along with many other beautifully arranged dishes, which were delicious. It was a congenial, friendly, and gracious evening with the Minister of Health toasting our friendship, and I responded with a similar toast. They gave each member of our party a gift.

Sunday, February 18

Sightseeing

About 8:30 in the morning we left in individual cars rather than by bus (the reason being that it would be about a two-hour drive and we would be more comfortable in automobiles — a most thoughtful and friendly gesture) for the Great China Wall. Dr. Wu and General Draper were in the first car with me. This provided us with a good opportunity to discuss with Dr. Wu various aspects of the organizational structure, development, and changes that have taken place over the past few decades in China's medical program, including medical education, health care delivery, family planning, and medical research. This gave us a better appreciation and understanding of the medical role within the political and social milieu of the country. We had an opportunity to see Chinese architecture and the countryside, mostly agricultural. We saw numerous farming villages, single-story structures resembling adobe huts, some with thatched roofs, often clustered together with a wall around them and an occasional single dwelling with chickens and pigs in the yard. Farmers were sometimes seen in the fields getting the ground ready for spring planting. We saw little or no farm machinery. They use mostly

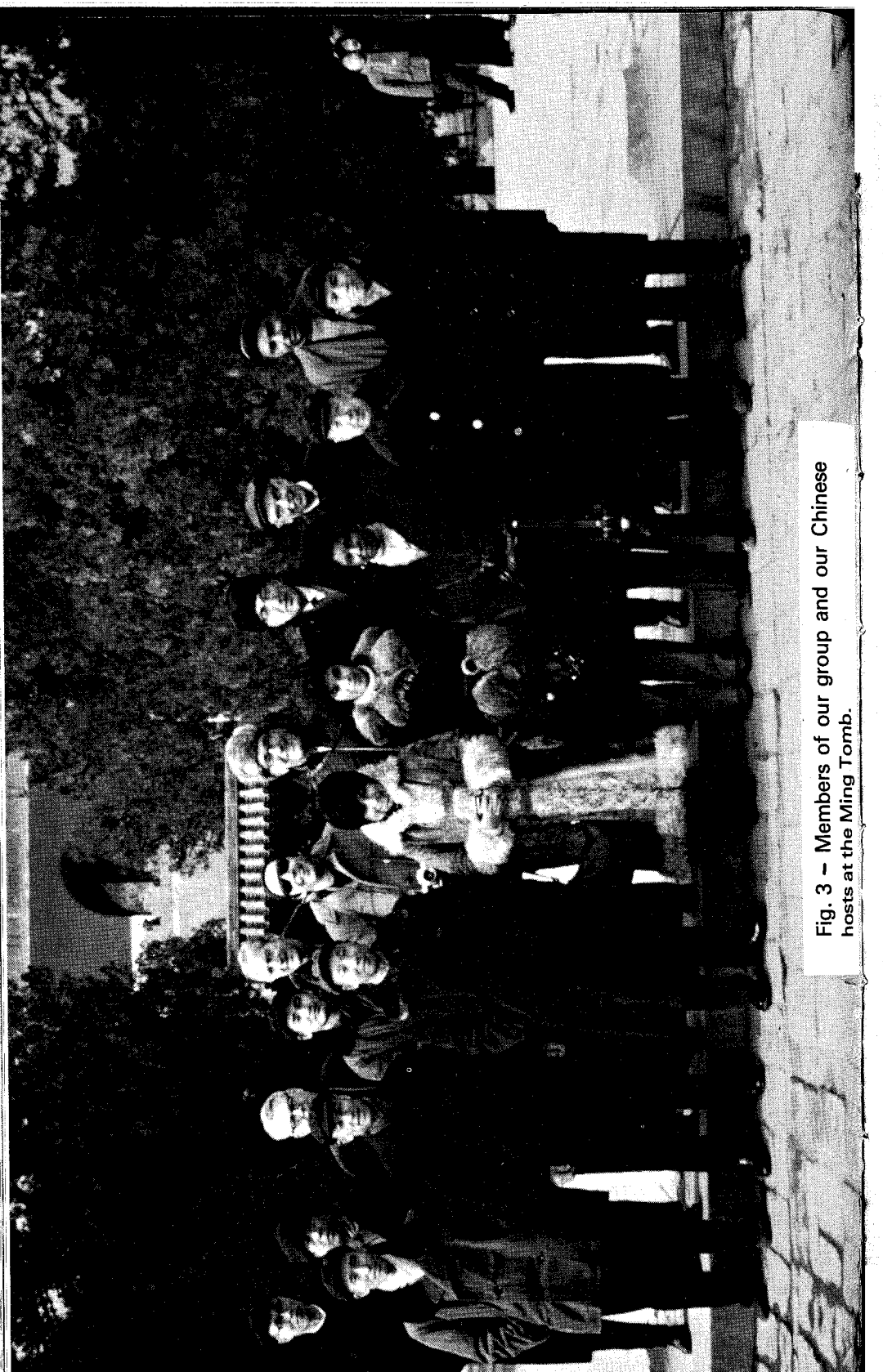

Fig. 3 – Members of our group and our Chinese hosts at the Ming Tomb.

horses, and we saw many horse-drawn carts with loads of wood and other objects on the road. Most of the farming villages are communes. The people looked healthy, and all were dressed more or less alike in blue or brown padded trousers and jackets of the Mao type. We also saw some soldiers but we encountered them only occasionally. The countryside was fairly flat until we got within about one-half hour of the Great Wall, and then we began to approach the mountainous region. The Great Wall could be seen in the distance as it wound over the mountain ridges. Finally we reached the wall itself and stopped to climb up by foot. It is indeed an impressive sight, some 20 to 25 feet high and about 15 feet wide. Built more than 2,000 years ago during the Ch'n dynasty and after the unification of China, it stands as an impressive reminder of the war-torn history of the early development of China as a nation. Groups of Chinese sightseers brought there by bus and some other foreigners were also seen.

We then were driven to a nearby inn to have a picnic lunch and then departed to see the tomb (Fig. 3) of one of the emperors of the Ming dynasty who lived about 1600. Apparently, this emperor had made elaborate plans to hide the actual tomb itself by placing a small monument in a temple-like structure with a plaque indicating that his tomb was underneath. The actual tomb was found accidentally by a peasant who was digging the ground nearby and unearthed a marble plaque that had an inscription stating that the tomb was hidden about 100 feet away. Excavation was then begun that ultimately revealed the underground tomb. We entered the tomb by walking down steps that were built after the excavation for a distance of about 50 feet. The gateway into the tomb was about 20 feet high and about 10 feet wide and led into a hallway somewhat larger with a high-vaulted ceiling. The hallway extended for a distance of about 200 feet with a smaller hallway on each side leading into two rooms housing the tombs of the empress and concubines. At the end of the main hallway was a large room that actually housed the tomb of the emperor, a large box-like structure painted dark red. On the walls of the tomb and in another building outside the tomb glass cases were provided showing some of the clothing, tableware, and jewelry of the emperor, and in contrast with these gold and silver ornaments, there were reproductions of the type of clothing and other material used by the peasants at that time with the clear message of how the peasants were exploited.

We returned to the hotel late in the afternoon. Dr. Becker and I had dinner with Dr. Manton to discuss our experience and give him a report

of our observations. He had just arrived the day before for a short visit and further discussion and plans for future group visits.

Monday, February 19

Old and New China

At 8:30 a.m. we met with representatives of the Ministry of Health, who presented a description of the structure, function, organization, and method of providing health care in China. It was explained that Old China was semi-feudal and semi-colonial. Epidemics were rampant and health conditions were poor. Up to 1947 there were only 9,000 qualified physicians and only 140,000 total health workers in the country. In the rural areas the people depended on the traditional doctors, and there were no hospitals in these areas. There were only 80,000 hospital beds, mostly in the cities. There was no modern pharmaceutical manufacturing, and virtually all modern medicines were imported.

After the Liberation, Chairman Mao emphasized health and developed 4 policies:

(1) Serving workers, peasants, and soldiers.
(2) Emphasizing prevention.
(3) Uniting Traditional medicine and Western medicine.
(4) Carrying out health service alongside of mass movement — mobilizing the masses to fight disease.

A campaign was started, termed Patriotic Health Campaign, to wipe out pests (fleas, mosquitoes, flies, rats, bed bugs, and snails). Reliance was placed on the people to do this, not on a few health workers. This was directed toward eliminating diseases most harmful to the masses, including smallpox, cholera, plague, tetanus, venereal disease, neonatal disease, and drug addiction. The secret to the success of this campaign lies in (1) leadership of the government and (2) reliance on the masses.

Next came the training of health workers. After the Liberation the medical colleges, run mostly by missionaires and a few private groups, were taken over by the government, when they were greatly expanded and new ones were established. Thus by 1965 there were 250,000 M.D.'s

and 490,000 middle grade doctors (assistant physicians, comparable to feldschers). Emphasis was placed on apprenticeship.

During the Cultural Revolution, enrollment was stopped in order to "sum up the experience," reassess the direction, and consider new changes. In 1971 they started enrollment again with radical changes. The curriculum was reduced from a 6-to-8-year course to a 3-year course to turn out more doctors. The admission policy was changed so that the student must (1) apply (2) be recommended by the masses, and (3) be checked and examined by the school. Emphasis was placed on giving the students practical experience and combining theoretical and practical training. Students were then sent to rural areas to learn and receive experience in class struggle, learn about the health of the people, and learn how to serve the peasants and workers. As a consequence the students became more willing to settle in the countryside.

Financial support for medical care is provided by three systems:

(1) Labor Insurance (factory workers). The worker gets free medical care paid by this insurance; his dependents pay only 50%.

(2) Officials of the government, college students, and faculty get free medical care paid by the government.

(3) Peasants (farmers). Health care is provided through the Cooperative Medical Service System or Commune. The members pay 1 yuan (about 50 cents). About 70% of Production Brigades have this system. It is generally favored by the peasants. The remaining 30% do not yet have this system.

Another important development which was a consequence of the Cultural Revolution was the determined effort to integrate Traditional medicine with Western medicine. It was recognized that doctors trained in Traditional medicine played an important role historically in providing medical service to the great masses of the people, and they were favored and accepted. The traditionalists used acupuncture and herb medicine. There were over 5,000 items of herb medicine. In "summing up the experience" during the Cultural Revolution the authorities decided that there was a need to benefit from this type of Traditional medicine, and the decision was made to unite it with modern medicine and to continue both in order to achieve a unique method of Chinese medicine. Doctors trained in both forms needed to learn from each other. Thus, Traditional medicine was included in the curriculum of medical schools of modern medicine, and vice versa. Modern medicine was included in the curricu-

lum of Traditional medical schools. Thus, two types of medical schools were established. It is hoped that ultimately this will lead to only one type of medical school, which is uniquely Chinese medicine.

The Medical Workers

There are several types of medical workers. First is the professional group, which includes physicians trained in modern medicine and in Traditional medicine, nurses, technicians, and the like. The second group is comprised of various types of health workers, including particularly the Barefoot Doctors. This term originated in 1958 in the southern area where rice is grown. The peasants in these areas are barefoot during the planting of rice in the paddies. Among the peasant workers were some who learned to care for the medical needs of other workers, prescribing herbs, caring for injuries, providing first aid, delivering babies, and the like. They became known as the Barefoot Doctors. In 1967 Chairman Mao highly praised them. After the Cultural Revolution their status was emphasized, and they were established as important members of the health team. They were greatly expanded — now numbering 1,300,000. They were given special training by mobile units sent to the rural areas and also by special courses in the urban centers and hospitals. From 1 to 3 Barefoot Doctors are in a Production Brigade. Their functions are to carry out preventive medicine, teach sanitation and hygiene, eliminate pests, report the occurrence of infectious disease, give vaccinations, deliver babies (midwifery), perform minor surgery, give first aid, carry out family planning, birth control, and perform acupuncture. They also survey the area for medicinal herbs, and collect and prepare them. It takes from three to five months to train these Barefoot Doctors. They are trained in the commune hospitals by mobile medical teams sent from the institutes and hospitals, by sending them to the urban centers where they get classroom instruction as well as practical experience. Each year they also get follow-up training during the slack season on the farm. In addition to their medical function, they actively engage in farming and other activities of the communes. They also now constitute a large potential for students admitted to medical schools.

Structurally, medical activities are organized at several levels. First is the Ministry of Health, which sets policy and goals. Under the Health Ministry there are 30 Health Bureaus directly under the Revolutionary Committee in each province and in the municipalities. These Health

Bureaus carry out various functions, including operation of medical education, research, provision of medical care in hospitals and clinics, preventive medicine, and family planning.

Family Planning

Great emphasis has been placed on family planning, which was begun in 1956. First they began by advocating late marriage. In old China girls were often married at 14 years. In 1951 the law was changed to 18 for girls and 20 for boys — now it is considered preferable to wait until 23 for girls and 25 for boys. Ideal size for a family was established as 2 children spaced 4 years apart. Contraception was advocated using condom, diaphragm, ointment, the Pill, and intrauterine device. Abortion, as well as sterilization, were done on request, and more women than men are sterilized. Government leadership was used to bring this to the people; all material is free. In rural areas the Barefoot Doctors carry out the family planning program. The growth rate has been greatly reduced to 1 per cent or 10/1,000 in Peking and about 2 per cent in rural areas. Infant mortality rate has been reduced from 200/1,000 in rural areas and 100/1,000 in Peking before the Liberation to 15/1,000 since the Liberation. The death rate is about 5-6/1,000.

The Commune

About 2:30 p.m. we left the hotel to visit a commune, termed the Sino-Romanian Friendship Commune. It was about 25 miles from Peking. It is essentially a cooperative farming community established August 13, 1958. The Vice Chairman of the Revolutionary Committee, Li Hsiou, told us that there were five production cooperatives in the commune with 11,000 families and a total of 46,000 persons. The land area was 59,184 acres. There were 21 Brigades, and they operated 8 enterprises. They produce 23,000 pigs annually and more than 10 million pounds of fruit, as well as vegetables of all kinds. Since the Liberation they have increased production by more than tenfold by means of irrigation, improving the soil, and mechanization of farming. Thus, they now have 580 pumping stations for water, 70 trucks, 307 tractors, and 902 horsedrawn carts.

We visited several of the enterprises. One consisted of a small factory for manufacturing small electric motors. All of the parts of the motor are

made in this factory from stamping out the parts, lathe machines, and assembly. We saw the employers at work, including many young girls. As we entered the various rooms where the employees were working, they would welcome us with applause, as did the children we encountered from time to time. From there we went to visit a small general store that served a segment of the community. They had food staples, clothing, drugs, and tablets and pencils for school children. Some of us bought a blue Mao cap (about $1.00). We then visited a small outpatient clinic and pharmacy at a lane station run by two Barefoot Doctors, young women and men about 25 years of age. They showed us a cabinet with many drawers containing herb medicines, most of which they had gathered from the local area. They had even prepared some in sterile vials for injection. The herbs were used mostly for stomach and intestinal disorders, colds, bronchitis, fevers, and similar ailments.

We then visited a typical farmer's home, which was a brick dwelling consisting of a central room about 12 feet square with a small fireplace at each end and a flue that heated the bed in the two bedrooms on each side, both rooms being about 12 feet square. They were furnished very simply with a small table, a few simple chairs and a small cabinet. The mother holding a child welcomed us with a smile. In the yard outside there was a pig pen with two pigs and a few chickens.

From there we went to visit a place where ducks are hatched and grown. The duck eggs are placed in an incubator for about three weeks, and when they are about 40 days old, they begin forced feeding. This is done by inserting a nozzle in the duck gullet, and with a pump handle food is forced through the nozzle into the gullet. The ducks are usually ready for market in about three months.

We then visited a small, 20-bed hospital. We were shown the small laboratory where they do simple tests on blood and urine, and a small pharmacy having both modern drugs, including antibiotics, and traditional medicines. There was even a small operating room with a stove at one end, and the Barefoot Doctor told us that she had performed about 30 appendectomies and some hernia operations. It was difficult to see how these operations were done with the simple facilities that existed and apparent lack of sterile conditions. Cleanliness was not a noteworthy feature of the entire hospital. There was also a small eye, ear, nose, and throat and dental clinic, also run by a Barefoot Doctor. They told us that they extracted teeth under acupuncture anesthesia. There

Fig. 4 – Open heart surgery using heart-lung machine with rotating disc oxygenator made in Shanghai.

was also a small medical clinic run by a traditional medical doctor. He said that most patients preferred to be treated by him, but if he found that a patient needed surgery, he referred the patient to the Barefoot Doctor who then could decide whether it was a condition she could take care of or whether the patient should be referred to another hospital, where better trained surgeons were required.

In addition to this hospital, the commune had 21 clinics with 450 Barefoot Doctors, 80 shops, and 19 primary schools. Each person pays about $1.00 per year to the Cooperative Medical Service for their medical care.

That evening at 7:30 I gave my lecture to a packed audience of the China Medical Association (about 250 doctors). My lecture, on coronary artery disease, valve replacement, and assisted circulation, illustrated with slides and movies, lasted two hours. Dr. Wu introduced me with a warm statement of our long-standing friendship and generous reference to my work in cardiovascular surgery. After the lecture they gave me a standing ovation that was most heartwarming.

Tuesday, February 20

More Surgery

At 8:45 a.m. I went with Dr. Wu to his hospital, which specializes in cardiovascular and pulmonary surgery. It has about 320 beds. Most of the doctors in this hospital are trained in modern medicine but a few specialize in acupuncture. We saw two operations. One was for coarctation and consisted of resection and end-to-end anastomosis with interrupted silk sutures. The other was closure of a ventricular septal defect using cardiopulmonary bypass (Fig. 4). The heart-lung machine was made in Shanghai using a roller pump, and the oxygenator was a rotating disk type. Both operations were done under general anesthesia. Here again the surgical procedures were competently performed with only essential paraphernalia in the operating room. The patients were monitored by means of a blood pressure cuff and a recording electrocardiograph. They had no electronic monitoring devices and no monitoring of blood gases and electrolytes. The instrument tray contained only the necessary instruments for the purpose of the operation, and silk ties and sutures were used exclusively.

We then saw a movie showing acupuncture anesthesia for removal of a posterior mediastinal tumor (neuroganglionoma), for mitral commissurotomy, and for right pneumonectomy. The method of acupuncture was similar to that used in the other chest hospital previously described, except that the acupuncture needle was inserted on the ventral aspect of the forearm. They told us that they used acupuncture anesthesia in about 20 per cent of the cases.

We made ward rounds and saw many patients recovering from myocardial infarction, which apparently is a common condition. The patients were in 2 to 4 bed wards. We also saw many patients with rheumatic heart disease. There were a few private rooms for higher officials. The patients with myocardial infarction ranged in age from 32 (male) to 78 (a woman). The ratio of males to females is about 2 to 1. They have not yet established an intensive coronary care unit. They have one room with a cardioversion unit which is used for patients with cardiogenic shock, but there are no electrocardiographic monitors in any of the rooms. They showed us an intravenous pacemaker made in Nanking with a fixed rate. This is the only type they have at the present.

Except for mitral valvulotomy no other type of valvular surgery is done. Dr. Wu stated that they had performed 2 valvular replacements before 1965 but none since, although there is an effort now to make artificial valves in Shanghai. This development, like certain other activities, was temporarily halted by the Cultural Revolution. We saw several patients with obvious severe valvular heart disease being treated medically only, and there were no plans for surgical treatment. They are doing some operations for congenital heart disease, and I saw one patient who was recovering well about one month after total correction of Tetralogy of Fallot. The angiographic studies on this patient were good. They also showed me a 14-year-old girl, with typical coarctation of the abdominal aorta demonstrated by angiography. She was suffering from severe hypertension. They were not familiar with this condition and asked me how I would treat the patient. I referred them to one of my published articles on this problem and told them that the bypass graft principle was preferred.

The Drive Against VD

One of the doctors on the staff whom I met there is a former American, a Dr. George Hatem, who is a dermatologist. In 1933 he went to China, joined the Communist Party, and participated in the famed Long March to Yenan (and has since become a citizen). He was formerly from North Carolina and has a brother there now. He is apparently quite content and is highly respected by his colleagues. He was one of the leading exponents in the drive to wipe out venereal disease. In accomplishing this task, he told us of the monumental problem that existed at that time because of the widespread prevalence of venereal disease. With their limited resources, he pointed out that the classic epidemiologic approach of tracking down and treating all the cases, performing, for example, several million Wassermann tests, was virtually impossible. Obviously, a more radical approach was necessary, and the first thing they did was to close down every brothel in a single 24-hour period. The owners and pimps were arrested, and the prostitutes were treated and "re-educated" and rehabilitated without stigma for more acceptable social purposes. Case finding and treatment in the populace still had to be done, but obviously this was too monumental a problem by the classic epidemiological approach. An entirely different approach was developed by "politicizing" the problem and involving the people in a lay campaign of education and participation. A simple questionnaire was developed that would turn up most of the cases. Groups of lay people were then brought in and given an intensive 6-weeks' course to learn how to administer the questionnaire and perform simple examinations and laboratory tests for venereal disease. People were told that venereal disease is not a stigma but the consequences of the old system of capitalism, foreign imperialism, and exploitation by the landlords. In the new socialism syphilis must be removed. By this means cooperation by the people was obtained, and subsequent studies by medical teams showed that 98 per cent of the cases could be identified by this approach and provided treatment with penicillin. On this basis a national conference was called, resulting in the application of this approach on a national basis, which ultimately led to the virtual elimination of a disease that had plagued the country for decades. It is an excellent example of the approach that has proved so highly successful in improving the health of the Chinese people.

This was a most interesting visit, since it gave us a good view of the level of development of modern medicine in China. Within certain limitations they are performing a high level of medical care. In certain areas,

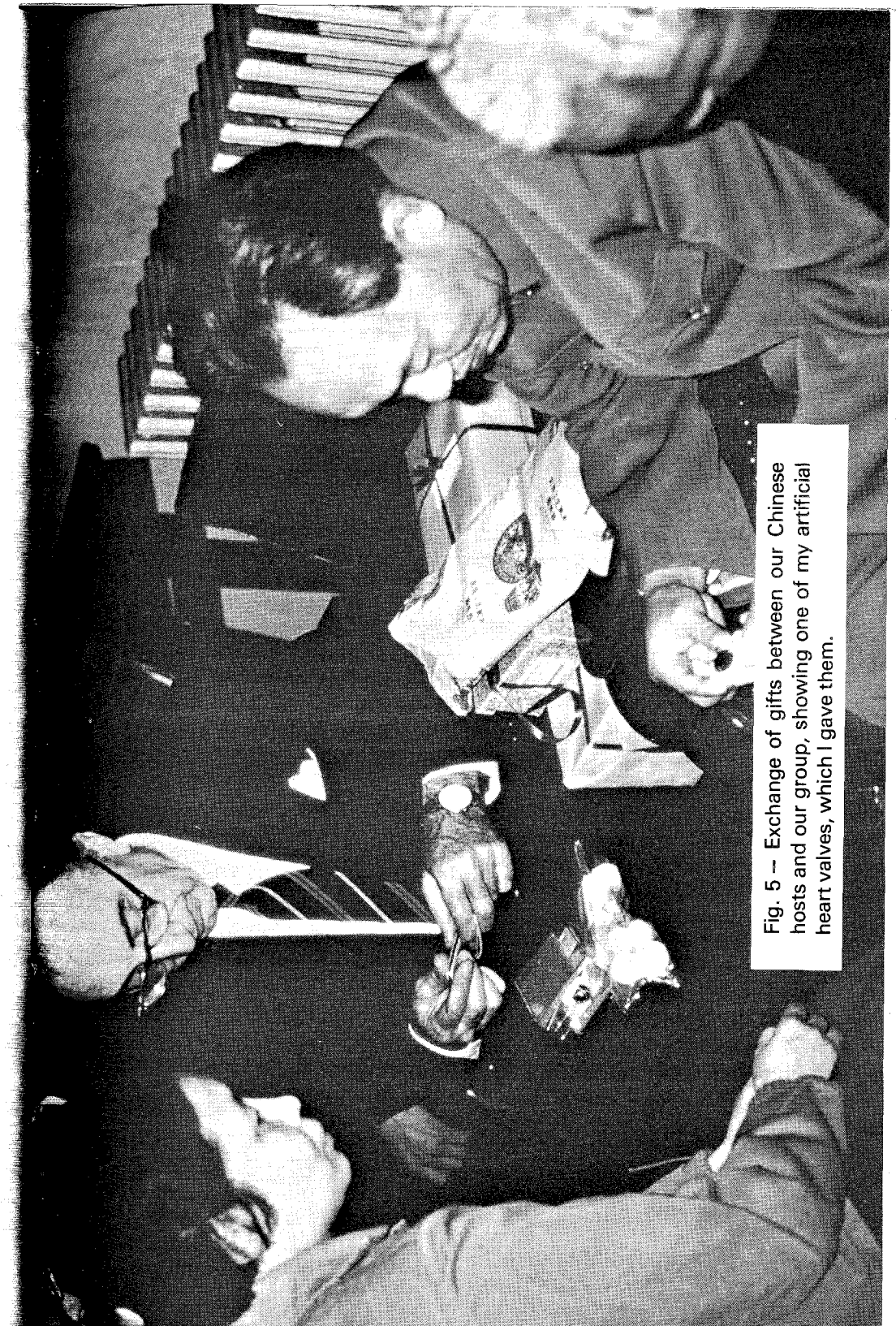

Fig. 5 – Exchange of gifts between our Chinese hosts and our group, showing one of my artificial heart valves, which I gave them.

however, and especially in some fields of acquired cardiovascular disease, they are still in a developmental stage. One gets the impression from various references that the Cultural Revolution put a halt to many developments and that they are now just beginning to recover and to plan for new developments to bring them up to date. It is not due to lack of knowledge but rather to lack of resources.

In the evening we went to the Peace Hotel for a dinner which we gave for our hosts, about 20 representatives of the Ministry of Health and the China Medical Association. The dinner itself was truly impressive with about 30 different courses beautifully arranged and served. This is considered one of the best restaurants in Peking, and the chief chef, whom we met, supervised the meal himself. We toasted each other to a warm and enduring friendship. It was a delightful affair, and they all reflected a warm and joyful spirit. They gave each of us gifts, and I gave them the heart-lung machine, 6 movies, some Dacron grafts, and our new heart valves (Fig. 5), which they deeply appreciated.

Wednesday, February 21

The Palaces

We spent the morning touring the Palace Museum (formerly called the Forbidden City) and observing some of the antiquities in the museum dating back to 3,000 years ago. It was a most interesting tour of some of the treasures of this old civilization.

Construction of the palaces was begun in 1406 A.D. and completed about 1420 A.D. It is considered the largest and most complete existing buildings of traditional Chinese architecture. Covering an area of about 720,000 square meters, the enclosure is surrounded by a wall 10 meters high and a moat 52 meters wide. The buildings include more than 9,000 rooms with floor space of 150,000 square meters. The Palace has two major parts, namely an outer part centering around 3 main Halls: (1) Taihotien (Hall of Supreme Harmony) or the throne room, (2) Chunghotien (Hall of Complete Harmony) or the ante chamber, and (3) Paohotien (Hall of Preserving Harmony) or the banquet hall. These are

flanked by Wenhauotien (Hall of Literary Splendor) and Wuingtien (Hall of Military Eminence).

The second or inner part was where the imperial families lived and the emperors conducted their daily activities. This consists of the Chienchingkung (Hall of Heavenly Purity), Chiaotoitien (Hall of Heavenly and Earthly Intercourse), Kunningburg (Hall of Earthly Tranquility), and 12 courts of the eastern and western areas. It has been stated that over the years more than 100 uprisings have been launched by the Chinese peasants against the feudal rule of this landlord class, and on some occasions they broke into the Forbidden City. We were also told that the Kuomintang in their flight to Taiwan took many of the most famous art treasures of the Palace Museum. Presently a great effort is being made toward restoration of the building and toward collecting and cataloging, for exhibit purposes, cultural and art objects.

At about 2:30 p.m. we left for the airport with a delegation of the Ministry of Health and China Medical Association to see us off for Nanking. They warmly expressed their appreciation of our visit and expressed the hope that we would soon return. We then boarded our plane (a Russian-built 2-engine plane similar to a DC3) and left for Nanking with one stop at Tsinjan. When we arrived at Tsinjan, we were informed that weather conditions would not permit us to continue to Nanking, and we would have to stay there overnight. We were taken by bus to the Chinese International Overseas Hotel, where we were comfortably ensconced.

Thursday, February 22

A Little More Time Off

At about 9:00 a.m. we left the hotel for the airport, but after our arrival there, we were informed that the weather in Nanking was still bad with a ceiling too low for landing. We were therefore taken back to the hotel to await further news at 1:00 p.m. as to whether we could fly or should take the overnight train that evening. They made hurried arrangements for us to visit a local exhibit of various crafts produced there primarily for export. We saw an impressive display of a wide variety of crafts from lace and embroidery to tapestry, rugs, and furniture. Beautiful and artistic paintings of various kinds, using different techniques such as feathers,

shells, and bark, were also exhibited. Bottles of various configurations and sizes painted on the inside surface and eggs made of various materials as well as real egg shell, decorated by painting on the surface, were also presented. It was a beautiful and impressive display of the highly developed craftsmanship and artistic talent of the Chinese civilization.

We returned to the hotel for lunch, and at 1:00 p.m. we were informed that the ceiling in Nanking had lifted. We immediately returned to the airport and boarded our plane. The trip to Nanking was uneventful, taking a little less than two hours. Upon our arrival there, we were met by a delegation headed by Dr. Ting Wen-Jung, Chairman of the Nanking Provincial branch of the China Medical Association, and were warmly welcomed. They drove us in several cars to the Nanking Hotel, which is more modern than the hotel in Peking and quite comfortable. The weather was somewhat milder than in Peking, where it was cold with snow still on the ground and the temperature ranging from 5 degrees to 15 degrees below zero. In Nanking the temperature was just above zero, and there was some green vegetation, which was in striking contrast to Peking, where there was no grass or other greenery. Apartment buildings and other structures were rather drab. About an hour after we arrived at the hotel we were driven to the Nanking Bridge, which spans the Yangtze River. This beautiful structure is a little over a mile long and rises about 100 feet over the water. It was started in 1961, apparently with the help of Russian engineers, but early during this period, there was a break in Sino-Russian relations, and we were told that the Russians began to sabotage its construction. The Chinese then took over its construction, and with the self reliance in which Chairman Mao had instructed the people they built the bridge entirely with Chinese resources, completing it in seven years.

At 7:30 p.m. the provincial branch of the China Medical Association headed by the Chairman, Ting Wen-Jung, hosted us at a formal dinner in the restaurant of the hotel. Here again there were many courses of delicious, beautifully arranged, Chinese food and much toasting to warm friendship. We were deeply touched by their warm and gracious hospitality.

Friday, February 23

Four Operations

In the morning we visited the Workers' Hospital, which has 520 beds and about 700 doctors, nurses, and other personnel. It is a general hospital staffed predominantly by doctors trained in modern medicine. It is a busy hospital providing services in all specialties, including general and thoracic and cardiac surgery. They see about 1,800 outpatients daily. Here again we were warmly welcomed by the chairman and members of the Revolutionary Committee with a sign in front of the hospital especially placed to welcome us along with hot tea in the conference room, where we conversed with the Committee members and staff.

In the operating room we observed four operations being done under acupuncture anesthesia. They use the auricular technic with 4 needles inserted in the ear and attached by electric wires to a small battery-operated unit that produces an electric current that causes a vibratory motion in the needles. We watched surgeons perform a thyroidectomy for a diffuse goiter; a gastrectomy for a duodenal ulcer (Billroth I); a gastrectomy for a benign gastric ulcer; and division of the nerve for trigeminal neuralgia. All the patients were relatively young, in the fourth decade, and seemed to tolerate the procedures well. Here again there was stark simplicity in the operating room. Only a blood pressure cuff was used to monitor the patient's physical condition. There was no blood transfusion equipment and only one intravenous catheter was present for administration of glucose and water. There was a minimum of surgical instruments, and silk sutures and ties were used throughout. Technically, the procedures were well done. It was remindful of the early days of using local and spinal anesthetics. The anesthesiologist, a woman trained in modern medicine, stated that they use acupuncture anesthesia in about 12% of the cases. The surgeon and anesthetist select the cases carefully, based upon the general condition of the patient, his temperament and reaction, and his proper preparation and consent. She emphasized that they were still in the experimental stage of development of this form of anesthesia.

I left the group about 11:00 a.m., returned to the hotel with Mr. Mao, packed my bag, and went to the railroad station to take the train to Shanghai. I was accompanied to the station by Dr. Ting Wen-Jung,

Chairman of the Kiang-su branch of the Chinese Medical Association of Nanking, and Mr. Cheng-Yi of the Chinese People's Institute of Foreign Affairs, Peking. (Mr. Cheng-Yi accompanied me on the train to Shanghai.) They very warmly bade me goodbye with the request that I come back soon. It was very touching.

To Shanghai

We rode the train to Shanghai in the first class section, where we had a very comfortable private compartment rather attractively furnished with lace curtains and a potted geranium plant. Hot tea was served, and we had lunch in the dining car. The train ride was comfortable and interesting. Most of the countryside we passed showed numerous farming communities. Indeed, it seemed that the whole country we passed was a continuing farmland with some large farming areas and some smaller ones, but all were beautifully prepared and manicured. There was much evidence of farm work going on with many field workers, mostly manual laborers with little evidence of mechanization. The farming included rice, wheat, and various types of vegetables. We would occasionally see farmers sowing seed by hand from a sack slung over the shoulder. There seemed to be as many women as men in the fields.

We arrived in Shanghai exactly on time (we were told that train service is excellent here) at 5:10 p.m. and were met at the station by Dr. Fu Shun-Lai, Chairman of the Shanghai branch of the Chinese Medical Association, and Dr. Lan Hsi-Chun, Professor of Surgery of the Shanghai Second Medical College, who greeted us warmly and then took us to the Hoping (Peace) Hotel, which was built in 1928 and at that time called The Cathay Hotel. It is still one of the best hotels in Shanghai, constructed along European lines with high ceilings and large, comfortable and nicely furnished rooms, but the downstairs bar is gone and the roof top night club is now a rather staid restaurant.

At 6:30 p.m. they hosted me in a special private dining room of the hotel at a typical Chinese dinner with much toasting to warm friendship and further strengthening of good relations between the Chinese doctors and American doctors.

Saturday, February 24

About 8:30 a.m. we left the hotel to go to the Third Municipal Hospital of Shanghai, which is a teaching hospital for the Second Medical College. It is a general hospital with 570 beds built in 1928. It has 11 departments, thus including all specialty services. They had scheduled an open-heart operation under acupuncture anesthesia.

Acupuncture and Open Heart Surgery

I was taken to the surgical suite, where I was given white pants and jacket to put on over my clothes and some canvas overshoes, a cap, and mask. I was then taken to the operating room, where the patient, a 21-year-old man, was lying on the operating table. The anesthetist told me that premedication included some luminal and about 10 mg of morphine. The patient, however, was not asleep, although from time to time he seemed drowsy but could be awakened throughout the operation. Four acupuncture needles were inserted in the left ear in much the same way as was done in the cases observed in Nanking. Then another needle was inserted on the ventral aspect of the left forearm about the junction of the middle and lower thirds, and another needle was inserted on the dorsum of the hand between the forefinger and thumb. This was similarly done on the right arm. Electric wires were then attached to each of the 8 needles, and an electric current was transmitted intermittently from a small unit with batteries similar to a pacemaker unit. I noted that the right finger and thumb contracted with each pulse of the electric stimulation. After about 10 minutes the operative areas on the chest and abdomen and both groins were prepared and draped. The surgeon then infiltrated the skin and subcutaneous tissues with a local anesthetic over the sternum at the site of the midsternal incision. (I was informed later that a local infiltration anesthetic was not infrequently used with acupuncture because the patient often felt pain when the incision was made in the skin. In fact, this had been found to be one of the shortcomings of acupuncture, and they considered it still to be in the experimental stage requiring further research.) After the incision was made, the sternum was divided with a hammer and chisel for about half the distance and the remainder, the upper half, with a Gigli's saw. The pericardium was then opened by a vertical incision, and the two edges were sewn to the subcutaneous tissue. The rib spreader was then inserted to open the sternal edges.

A clinical diagnosis of a ruptured sinus of Valsalva had been made but not confirmed by cardiac catheterization or angiography. I was told that this method of diagnosis was only occasionally used in complicated or difficult cases. In most cases the diagnosis was based on clinical findings.

The surgeon first placed a purse-string suture of silk around the right atrial appendage and inserted his finger to explore the atrium. He stated that he felt the ruptured sinus of Valsalva in the right atrium. He then removed his finger from the opening and inserted a plastic tube into the opening and up into the right superior vena cava. With a partial occluding clamp he placed another purse-string suture on the right atrium and inserted another plastic tube into the inferior vena cava. Both tubes were long enough to be handed to the technician operating the heart-lung machine (which was similar to that previously observed — with a roller pump and rotating disk oxygenator). In the meantime, an assistant has exposed the right femoral artery and cannulated it with a tube connected to the heart-lung machine. Partial cardiopulmonary bypass was then instituted. The heart was lifted, a purse-string was placed in the apex of the left ventricle, and a sump was inserted. Another sump was inserted into the left atrial appendage. (It was not clear why it was necessary to use two sumps.) Cotton tapes, previously placed around the superior and inferior vena cava, were tightened, and complete cardiopulmonary bypass was started. A clamp was placed across the pulmonary artery and aorta, and the heart soon went into ischemic arrest. At this point the patient seemed very drowsy but could be awakened and would open his eyes and respond to questions.

An incision was made in the right atrium, and after the blood was aspirated and the interior of the right atrium was exposed, the characteristic nipple with a small opening at the tip of the ruptured sinus of Valsalva was readily seen. It was then closed with interrupted sutures of silk. The clamp across the aorta and pulmonary artery was removed, and the heart soon went into fibrillation. The heart was shocked once and converted to sinus rhythm. Progressively, the catheter sumps in the left ventricle and atrium were removed and the catheters in the right atrium, and then cardiopulmonary bypass was discontinued. The total operative time was about three hours, and the patient was on bypass about one hour.

It was interesting to observe that even with the heart in ischemic arrest, the patient could be aroused, could open his eyes, and could even respond to questions. The surgical procedure was performed smoothly and with technical skill. The only monitoring that was used during the operation was periodic electrocardiographic recording with a portable machine and determination of the blood pressure with a cuff on the arm; no blood gases or electrolyte studies were done. About 500 cc of blood was given during the operation. Here again, I was impressed with the stark simplicity of the operating room facilities and paraphernalia. There was a Bovie unit, which was used during the operation, and general anesthesia apparatus, which was not used, although the patient was given oxygen through a nasal catheter. In spite of these limitations (by our standards) the operative procedure was successfully performed with the patient in good condition.

I returned to the hotel for lunch, and in the afternoon, was taken on a sight-seeing tour of the city.

Shanghai Story

Beginning in the 13th century as a fishing village, Shanghai has a long and interesting history with periods of turbulence as well as social and economic developments that greatly influenced the more recent and modern changes in the entire country. Strategically located about midway on the coast at the outlet of the Whangpoo River, it rapidly developed into a flourishing port for international trade. For more than 100 years following the wake of the Opium War in 1843, it was dominated by foreign influence, bringing the city certain aspects of Western culture, an international environment, industry and commerce, and a "Paradise for the Adventurers." It also has a revolutionary tradition; the Communist Party was founded here on July 21, 1921. After the city's "liberation" in May 1949, strenuous efforts were directed toward its industrial development, and it has now become perhaps the most important industrial center in China. I was informed that there are more than 10,000 production units involving about 1.5 million workers. Its leading industries comprise a wide variety of interests, including metallurgy, chemicals, textiles, electromechanical products, shipbuilding and various light and heavy industries. Most medical equipment is made here. In addition to its vigorous industrial activities, it is also an important cultural and educational center. I was informed, for example, that one-fourth of its population, which now exceeds 10 million (that does not include the teeming metropolitan suburbs) is composed of students.

As we drove about the city, one could get the sense of a bustling activity but at the same time without the sense of overcrowding. There are no traffic jams on the streets, since there are few motor vehicles — mostly buses, trucks, and a few private official cars, such as the one in which I was riding. Bicycles are numerous in Shanghai, as they were in Peking, but traffic moves in orderly fashion. Many of the buildings in the heart of the city reflect the European influence, having been built during the period of foreign domination in the late 19th and early 20th centuries. We passed by the former residence of the late Dr. Sun Yat-sen, which reflects this same influence and has been beautifully preserved. Many of the massive Victorian mansions of the International Settlement and the French Concession where the Foreign Colony previously lived, like a state-within-a-state, have now been converted into apartment houses and offices.

As we drove along the Bund that faces the muddy Whangpoo River and harbor, we could observe the skyscrapers that lined the street, which were built over 40 years ago by various British and European firms and trading companies, but are now occupied by various Chinese government agencies. The Shanghai Municipal Revolutionary Committee, for example, now occupies the previous ornate headquarters of the British-owned Hong Kong and Shanghai Bank. The famed luxury shops that previously lined Nanking Road are all gone and have now been replaced with government-owned pharmacies, hardware stores, clothing shops, noodle stands, and other shops providing the necessities of life rather than high-fashion offerings. Gone, too, are the myriad brothels, gambling parlors, bars, and opium dens, which once gave the city the dubious distinction of being the global capitol of vice. After the Communists came to power in 1949, public bonfires destroyed the gambling paraphernalia and opium pipes. Bars and brothels were closed, and the prostitutes were sent to reformatories, where they were instructed in various types of trades for more socially acceptable employment.

I then returned to the hotel, had an early supper, and at 7:30 p.m. left for the airport. They again expressed their pleasure in having me visit them and regretted that it was so short, stating that I must return to see them again and to give some lectures (which I was unable to do on this visit because of lack of time). Their farewell was most heartwarming as I boarded the flight (Pakistani 753) to Karachi.

When we arrived in Peking (which was the first stop of the flight), an official came to my seat and stated that a delegation of the Chinese Medical Association was in the airport waiting to see me. When I arrived at the airport, 3 members of the delegation met me, stating that they had come out to bid me a warm farewell on my return trip home. They knew from my schedule that I was on this plane and wanted to come out to see me off. It was indeed a heartwarming expression of their sincere friendship. They again stated that they hoped I would return soon. It was indeed a beautiful expression of the warm sentiments expressed throughout my visit and a most pleasant way of embarking on my journey home.

Commentaries.

China's Health Care System

Health care and health maintenance have been an integral part of the dynamic forces affecting the revolutionary changes that have taken place in China during the past few decades. Whereas the emphasis placed on health care and the official policy to give it high priority have remained unchanged from the beginning, the mechanisms for implementation, the organization of the system, and the development, training, and use of health personnel directed toward this objective have continued to undergo changes that sometimes could be characterized as radical, causing upheaval in certain established medical circles. At present these forces of change have become more evolutionary than revolutionary but no less dynamic, owing in large measure to an attitudinal and somewhat altruistic espousal by the people, especially the health workers, of the inspirational message of Chairman Mao Tse-tung.

Both in relation to the economic development of the country and the effective use of its largest and most important resource, its manpower, the Chinese Communist leaders early recognized the urgent need to develop an adequate health program for its people and especially for its largely rural population. Accordingly, Chairman Mao promulgated certain goals and standards directed toward four major objectives: (1) to emphasize prevention, (2) to serve the peasants, workers, and soldiers, (3) to unite Traditional and Western medicine, and (4) to coordinate medical programs and campaigns with mass movements.

During the period of economic rehabilitation (1950-1952), the Communist leaders concentrated on organizing a system of health care for the masses and on eradicating epidemic diseases. The Ministry of Public Health, established in 1949, reorganized the existing hospitals and research centers. Private practitioners of Western medicine were urged to join the traditional medical practitioners to form United Clinics to serve the state. The government made a concerted effort to provide, as quickly as possible, trained medical personnel to serve all the people, but particularly the rural and factory workers, whose health had long been neglected. Medical schools were enlarged, and the curriculum was changed to insure the training of sufficient doctors to serve all the people. Recognizing the need to nurture its greatest resource — its manpower — the government instituted measures to redistribute the medical personnel from the cities, where it had been heavily concentrated before the Cultural Revolution, to the country, where the peasants had been virtually ignored by the medical profession.

In accordance with the advice of the First National Health Congress to provide health care for the masses, in 1950 the government revamped the health care system into four basic units: Epidemic Prevention Stations, which reported all communicable diseases and innoculated the people against these diseases; Affiliated Clinics, which delivered medical care to the local residents and conducted health programs for them; Red Cross and Red Crescent Societies, which insured sanitation and rendered first aid in the event of a disaster; and Spare Time Clinics for factory and mining workers, which rendered first aid, performed routine physical examinations, gave innoculations against infectious diseases, and checked on sick absentees. All four units provided health education for the masses.

To make optimal use of the small number of Western-trained physicians in China at that time, the government organized health teams headed by one of these Western-trained physicians. The teams were made up of various grades of auxiliary workers, including specialists with two years of training in one field of medical care, nurses and laboratory technicians, hygiene workers with three to six months' training in environmental problems and disease control, and part-time workers with one to three months' training in immunization procedures and recognition of endemic diseases.

With this organizational system of health teams, the Chinese leaders could now introduce methods to eradicate the prevalent infectious

diseases. In 1952 they initiated "Patriotic Health Campaigns," in which the entire population engaged, in an attempt to improve the sanitary conditions of the water supply and to eradicate rats, flies, mosquitoes, and bedbugs — the four common pests. Because these campaigns were not very effective initially, they were soon replaced by "Shock Attacks," directed toward immediate participation of the people in health campaigns designed specifically to eradicate communicable diseases.

During the early period of economic rehabilitation (1953-1957), because of the government's emphasis on development of heavy industry, the health authorities concentrated on implementing methods to improve the health of the industrial workers. But in 1956, the Chinese leaders turned their attention to agricultural development in order to make the best use of their tremendous manpower. Health policies were therefore established to bring health care to all rural workers. These policies formed the basis for the Health Care System of China today. The program consisted of a network of county hospitals, and health centers in areas without hospitals, which provided medical care for rural workers, organized patriotic health campaigns, assisted the smaller health units, provided health teams for remote areas, and trained paramedical personnel.

Recognizing the need to staff these expanded medical facilities, the government instituted measures to synthesize Traditional and Western medicine. In this way, they could make use of all available medical personnel. They introduced into the medical curricula both systems of medicine and encouraged medical students to study both types. They also provided special courses in Chinese medicine and urged Western doctors to enroll in these.

The rural medical service was also rapidly improved by rotating highly trained physicians in the cities, on a year's leave from their practices, in order to teach the people in rural areas to organize and maintain local health services. And finally, a new kind of paramedical personnel was created. The precursor of the Barefoot Doctors, these health workers learned, on a part-time basis, to treat simple ailments and to instruct the rural workers in preventive and sanitary measures. By 1956, 30,000 traditional medical practitioners had been integrated into the public health system. Their methods of treatment were particularly suited to the rural Chinese people, who comprised a large segment of the population and formed the backbone for economic development of the country.

These health workers were agricultural or production workers, housewives, or retired people, who devoted part time to medical work. Being peasants themselves, they knew and understood the needs of their patients and consequently were able to give them better medical service than would strange urban physicians.

The communes, which were organized in 1958, had their own medical units or rural health centers, which they operated, but the state continued to operate the county hospitals. The rural health centers provided medical care for out-patients and regional health work; directed the mass campaigns; controlled contagious diseases; inspected public mess halls, nurseries, kindergartens, and maternity hospitals; delivered medical care; trained medical personnel; and planned and implemented preventive programs.

Between 1960 and 1965 the authorities stressed self-reliance and development of urban rather than rural areas. Their encouragement of medical research and training slowed the progress of development of health services for the masses. Despite this temporary setback, the number of county health centers in rural areas increased from 60,000 to 210,000 within a period of five years.

In 1966 a renewed effort was made to hasten the expansion of the rural health services. Within a few months, 1,600 mobile medical teams had been placed in the rural areas. A Rural Health Institute was established to help the health teams control disease and promote the health of the rural workers. The mobile medical teams trained the Barefoot Doctors and thus enlarged the medical auxiliary force. In 1969, another category of health worker appeared in the communes. Called family health workers, they treated minor illnesses and helped maintain sanitary conditions and promote health campaigns in the communes.

Out of these dynamic forces of change has evolved China's current health care system. Within the short span of a quarter of a century, the health authorities have succeeded in changing their health care system from one that provided adequate care only for the elite few to one that delivers a good quality of primary health care reinforced by adequate specialized medical care to about 800 million people today. This remarkable feat was achieved by establishment of a network of health stations that provide graduated levels of health care: lane health units, neighborhood health centers, local community and district health bureaus, and district and medical school teaching hospitals.

The Lane Health Units

The first level, the lane health station, can be likened to a first-aid station. These units are strategically located within walking distance of all the homes on several streets. One of these, considered typical, had a waiting room, two examining rooms, and a pharmacy with a bench for simple laboratory tests. Three Barefoot Doctors with varying degrees of training and medical proficiency operated it. Under supervision of doctors from the neighborhood health center, they diagnose and treat minor ailments in the mornings. Here, the Barefoot Doctors practice primarily Traditional Chinese medicine (acupuncture and use of herbs). In the afternoon, they practice preventive medicine (immunizations and family planning) and educate the people in hygienic measures, going into the homes, workshops, and factories. They also do follow-up visits in the homes, nursing, give injections to patients confined to bed, and deliver medicines to patients. Such a clinic, which is open eight or nine hours a day, takes care of about 50 patients daily.

The Neighborhood Health Center

The next level of medical care is provided in the neighborhood health center, which delivers what we would call primary medical care. One of these units was housed in a rambling two-story building which contained complete laboratory facilities, a pharmacy, and even a few observation beds. The staff of more than 100 included 7 "middle doctors," 5 traditional doctors, 38 nurses and nurse-midwives, 5 pharmacists, 3 laboratory technicians, and 21 administrators and administrative assistants. In addition to providing primary medical care, they supervise the preventive medicine and hygienic education programs in the lane health units. This includes immunization, environmental control, and public health. They also supervise all home visits made by the barefoot doctors. This unit averages 600 ambulatory visits a day.

These two basic units are integrated into a regionalized hospital system, where specialized care is available. Thus, at the lowest level, the simplest ailments are treated and as the problem becomes more complex, it is handled at the next-higher level of more specialized medical practice.

China has three systems for payment of medical care: the laborer's insurance plan, the central government program, and the commune — or neighborhood-based cooperative prepayment plan. Each factory pays a labor insurance premium into a national fund. The worker pays nothing, but this labor insurance plan pays for all of his health care costs including hospitalization, and it pays half the expenses for health care for each dependent, the worker paying the other half. The central government pays the entire cost of health care for all categories of workers classified as serving the national interest, as well as the cost for their dependents. Included in this classification are medical and university students, public officials, and administrators. People in the rural communes and in many urban neighborhoods pay to a Cooperative Medical Service System a minimal health insurance premium for each member of the family. The average premium is about 20 cents per person per month, or 0.08% of the average annual family income. Provision is also made in many areas for exorbitant costs of surgical treatment or specialized hospitalization for the child of a factory or rural worker only partially covered by insurance. The commune or Revolutionary Committee discusses these cases, and if they deem it warranted, they will make a grant or loan (without interest) from a general welfare fund taken out of the commune's collective net income, which the worker can pay back on a long-time basis.

Impressive Progress

The progress that has been made within the past two decades by the People's Republic of China in the distribution of health care is indeed impressive. Within the short span of two decades the authorities have succeeded in almost completely eradicating venereal disease and drug addiction through public education, in controlling infectious diseases through innoculation, and in reducing the incidence of parasitic diseases through water purification and education in sanitation. They have brought to the masses better health care which, before the Cultural Revolution, had been available only to the privileged few. And they have been able to shift the direction of medical care from treatment to prevention. The once rampant birth rate is now under control as a result of education in contraception and planned parenthood and the availability of abortion to pregnant women. According to the Ministry of Health, they have increased the number of physicians from 9,000 qualified physicians before 1947 to 250,000 by 1965 with 490,000 middle grade

doctors. According to Sidel,* at the onset of the Cultural Revolution in 1965 there were 150,000 doctors of Western medicine, 500,000 doctors of Chinese medicine, 30,000 stomatologists, 20,000 pharmacologists, 170,000 assistant doctors, 185,000 nurses, 40,000 midwives, and 100,000 pharmacists. This incredible increase in a period of 17 years was accomplished by the reconstruction and rapid expansion of China's existing medical schools along models provided by Soviet advisers. They have increased the number of hospitals from about 500 before the Cultural Revolution to an expansive and regionalized network of urban hospitals, and specialized centers, neighborhood health centers, spare-time factory health clinics, and rural health clinics, which deliver health care to virtually all inhabited parts of China.

Perhaps the greatest and somewhat ironic tribute to their extraordinary accomplishment in improving the health standards of their people is the fact that heart disease and cancer have now become respectively the Number One and Number Two causes of death just as they are in Europe and in our country. One may predict that they, too, will focus greater interest and attention toward a more concerted attack on these great killers.

Reference

* Sidel, V. W.: Medical Personnel and Their Training, in *Medicine and Public Health in the People's Republic of China,* edited by J. R. Quinn, DHEW Publication No. (NIH) 72 - 67, U.S. Department of Health, Education, and Welfare, Public Health Service, National Institutes of Health, June 1972, p. 156.

Medical Education

The progressive developments in medical education and in training of health personnel in China since 1949 have been extraordinary and may be considered both evolutionary and revolutionary. A better appreciation of the intensive, as well as extensive, nature of these changes can be gained by considering this realm of activity in three periods: (1) Before the "Liberation" (1949), (2) From the "Liberation" until the Cultural Revolution (1949-1964/65), and (3) Since the Cultural Revolution.

Before the "Liberation." In 1949 Mao's People's Liberation Army wrested control of all mainland China from the Nationalist forces under Chiang Kai-shek. It may be recalled that during this period and before the early 19th century, when Western medicine was introduced into China, the medical needs of the people were largely served by the practitioners of Traditional Chinese medicine (referred to as Zhongyi). This system of medicine has a long history extending back for more than 3,000 years and is integrally interwoven in the fabric of Chinese culture and philosophy. Its theoretical basis is founded on the *Yin-Yang* doctrine of opposing cosmic forces and the flow through the body of the vital force *ch'i,* which circulates in accordance with changes of the five "elements" or "five productive phases," namely, wood, fire, earth, metal, and water. Accordingly, health was based upon an equilibrium or harmony between these purported life forces, and illness occurred when harmony was disturbed. As a consequence of these concepts, there developed a strong base of empiricism in the approach to medical therapy, designed to restore internal harmony. Over the centuries a system of diagnosis was developed, based upon close observations of external signs and pulse lore which were directly related to the underlying concepts of the five productive phases, *ch'i* and the 12 meridians through which *ch'i* was assumed to circulate. Based upon these concepts and directed toward the restoration of internal harmony, the basic therapeutic techniques which evolved were concerned largely with the use of drug therapy and acupuncture. An extensive Materia Medica was developed which included drugs derived from various sources, such as vegetables (herbs), animals, and metals and minerals.

Western medicine (referred to as Xixi) was introduced in China by the missionaries. In 1827 Robert Morrison, an Englishman, founded a dispensary for the poor Chinese in Macao and in 1835 Peter Parker, an American and the first full-time medical missionary, established the Canton Ophthalmic Hospital in Canton. After the Opium War (1832-1842), China became semi-colonized by Western colonial powers, and after the Treaties of Tientsin in 1868, the entire country was open to Western missionary and medical-missionary work.

Although there was initial distrust of this form of medicine, interest in it gradually increased, and some Western medical schools were established through the support of institutions in the United States and Europe. Probably the best known of these was the Peking Union Medical College, which was founded by the China Medical Board, an affiliate of the Rockefeller Foundation. The board assembled a distinguished faculty from the United States and designed a curriculum based on the Western medical educational system, which compared favorably with any in the United States.

Thus, during this latter period there developed a dual system of medicine in China between which there was little interchange, with occasional periods when some bitterness developed between them, and there was even some effort to suppress the practice of Traditional medicine. More recently, efforts have been directed toward their merger with the ultimate goal of one system of Chinese medicine.

It should be noted that although the quality of education provided by the Western medical schools established during this period was comparable to that of Western Europe and the United States of America, their output of Western-trained physicians was limited and woefully inadequate for the needs of the population. We were informed, for example, that during the 20-year period, 1927 to 1947, they produced only 9,000 M.D.s and only about 140,000 total medical workers. It was estimated that by 1949 the ratio of physician-to-population was about 1 per 13,000. In the United States this ratio is about 1 per 700.

From the "Liberation" to the Cultural Revolution. After the Communist party assumed control of all of China in 1949, usually referred to as "the Liberation" by the Chinese, the new government directed special attention to medical education with a view to training, as quickly as possible, sufficient doctors to "serve the people," which was the underlying philosophy of all revolutionary changes that had taken place in the People's Republic of China. Although they continued to use the medical schools they had, they began to reorganize them in an effort to make optimum use of the available facilities. On the advice of Soviet

educators, they separated the medical schools from the universities and divided them into schools of therapeutics, public health, pharmacy, and stomatology. Most curricula included 36 courses and required six years to complete, although some, which concentrated on training of teachers and researchers, required eight years of study. By 1962 there were about 60 Western medical schools and 10 Traditional medical schools in China. Formal training in Traditional Chinese medicine consisted of an academic course as well as an apprenticeship.

As a consequence of these accelerated efforts the output of physicians was considerably increased. Thus, during the period, 1942 to 1965, they had trained approximately 250,000 physicians, 490,000 second-grade doctors, and over 700,000 total medical workers.

Since the Cultural Revolution. The most radical change in medical education and in the training and utilization of medical personnel, both at the professional and sub-professional levels, occurred during and as a consequence of the Cultural Revolution, beginning about 1964-65. It is generally believed that the basis for this convulsive upheaval among the people was a power struggle at the highest level of Communist hierarchy. Underlying this power struggle were two ideologically different philosophies of government represented by Chairman Mao Tse-tung on the one hand and his Constitutional Chief of State and heir apparent, Lin Shao-ch'i, on the other. The latter represented the old-line Communist party cadres who espoused the basic philosophy of an elite and managerial class to run the government. Chairman Mao Tse-tung won the power struggle by obtaining the support of the students, the peasantry, and the military by expressing the opposing philosophy that management must be returned to the workers and to the people of the state.

During the Cultural Revolution, the Western medical schools came under severe criticisms which, along with the social disturbances, resulted in their closure for several years. In accordance with the ideological philosophy of Chairman Mao and his followers and as an integral part of the power struggle with Lin Shao-ch'i and his "elitist" philosophy, the criticisms leveled against the medical schools were that they failed to place proper emphasis on service to the rural worker, industrial worker, and soldiers. Instead, they were accused of developing undesirable attitudes in the students who, upon graduation, were

interested primarily in promoting their own ambitions for wealth, fame, and position, and therefore in congregating in the urban centers. Moreover, the curriculum, which was modeled after the Western medicine system, was not considered to be structured for the pragmatic needs of study, the graduates had yet not received adequate clinical training in the treatment of even the commonest diseases.

During this period of upheaval when all the medical schools were closed, the faculties were dispersed to the countryside for "re-education" by the peasants, workers, and soldiers. Although there was no discernible pattern of distribution or definitive responsibility, the apparent objective of these social forces of "struggle" and "criticisms" was the transformation of the medical education process toward a national concern for the dependence upon productive labor and thus to delineate the national health policy. Accordingly, in this "re-education" process primary emphasis was placed on rural health needs, reorganization of health services, and facilities to insure equitable allocation and universal access and proper distribution of health manpower through a centralized authority.

The New System

After the power struggle had been won by Chairman Mao and his followers, a radical re-structuring of the hierarchy of the medical schools took place with the establishment of the "Revolutionary Committee" principle to operate the institutions. A new system was then designed directed toward the development of the type of medical personnel considered more appropriate to the needs of the populace and inculcated with Chairman Mao's "thoughts" of service to the people. In the critical re-evaluation of the old curriculum and its relevance to the medical needs of the people it was believed that much of the six years was wasted on studying abstract theory, which had no practical application.

The medical authorities are still experimenting to determine the ideal course of study for their particular needs. For this reason, the curricula vary from school to school, but most schools have a three-year, 15-course curriculum, with emphasis on subjects that have practical application. A fairly typical three-year program includes study of anatomy, physiology, biochemistry, histology, bacteriology, parasitology, pharmacology, pathology, laboratory and physical diagnosis, physical and military training, political education, and Traditional Chinese

medicine during the first year. In the second year the students receive clinical training in internal medicine, pediatrics, surgery, obstetrics and gynecology. During the last three months of the second year and the first half of the third year, they go to the rural areas with their professors to receive practical instruction in clinical medicine, public health, epidemiology, and traditional and herbal medicine. With their teachers the students also perform physical labor in the communes. In Canton, the curriculum is only two years. The first three months are devoted to anatomy, histology, biochemistry, and physiology. For the next three months, three teachers and groups of about 30 students go to the rural areas for instruction. For the remaining six months of the first year the students study pharmacology, parasitology, pathology, and physical and laboratory diagnosis. In the second or last year, the students take four months in internal medicine and pediatrics, four months in surgery and surgical specialties, and four months in the rural areas applying, under supervision, what they have learned. They also take a course in Traditional Chinese medicine and in Mao's philosophy. There are no elective courses. The medical curriculum will obviously continue to be modified in accordance with social changes and the people's needs.

Student Selection

The criteria for selection of students for admission to medical schools are also dictated by the people's needs. Allocations are established for each region, depending upon the population and the need for physicians in the area. Thus, a given county may be authorized to nominate three applicants while the entire province comprising all the counties may be authorized to nominate 300 applicants. The Red Army is authorized to nominate a certain number allocated according to their needs. The number of women students has also been allocated in accordance with a ratio of about 40 per cent of the total. It would also appear that admissions are weighted in favor of former "medical workers" or Barefoot Doctors, since they comprise about one-third of the classes. Before a student can apply for admission to medical school, he must have graduated from a high middle school (the equivalent of our senior high school) and worked in a commune for at least two years. He must apply voluntarily for admission to medical school. Members of his commune then meet, deliberate, and if they agree, recommend him for admission. He must also get the approval of the leaders of his commune, who submit his credentials to the medical school. After reviewing all the

documents, the Admissions Committee makes the decision to accept the applicant if he fulfills the following criteria: he must be between the ages of 18 and 25 years, unmarried, and in good health; he must be well versed in Chairman Mao's philosophy; he must have had at least two years' practical experience in class struggle, production struggle, and scientific experimentation. Students do not pay tuition. Rather, they receive a modest stipend for living expenses.

Evaluation of student performance by some form of uniform standards or grading system has not been firmly established and apparently varies in different institutions. To some extent this may be a consequence of the devaluation of grades as a means of assessing qualification for admission and the assumption that the teachers should know their students well enough to evaluate their knowledge. Curiously enough, examinations are given and a numerical grading system is employed, at least in some schools, but this is used as a means of apprising the student of the material that he has not entirely mastered, or of informing the professors of what they have not successfully taught. Accordingly, the failure rate is extremely low. Interestingly enough honors and tributes are awarded for distinguished scholastic achievements.

It is readily apparent that there is a striking contrast between the criteria used for selection of medical students in China and in the United States. In the latter process, primary emphasis is placed upon the student's demonstrated capabilities based upon a score that involves grade averages and aptitude tests, whereas in the former process these criteria assume much less importance and validity with primary emphasis given to the sponsorship and recommendation of the "Revolutionary Committee" of the various communities or institutions where the candidate resides or works. Still another important difference lies in the educational background and maturity of the candidate. In the former the candidate may qualify for admission with an educational background that is comparable to our senior high school level, whereas in the latter at least several years of college education including certain courses in the biological sciences are considered essential. Finally, another important difference lies in the ultimate decision-making process concerning the applicant's acceptance or rejection by the medical school. In the United States this authorization is vested in the Faculty's Admission Committee, but in China the impression was gained that while the medical school has the right to reject an applicant, it rarely does so if the applicant has the full endorsement of his sponsors.

Despite these striking differences in criteria for selection of medical students as well as in the medical curriculum itself, any judgment or conclusion concerning their relative merits must be tempered by a clear understanding of the great differences in the economic, political, and social milieu of the two countries. The urgent need and the strong national commitment at the highest level of central authority to provide adequate health service to the people have assumed a priority of the highest degree. In this context of the ideological philosophy of the central government, medical education as a fundamental mechanism of providing health services to all the people constitutes a political modality.

Ancillary medical personnel also receive formal training, but the period of medical training is much shorter, ranging from only 10 days to six months, depending on the grade of worker. Barefoot Doctors receive theoretical and practical training in county or commune hospitals for a period of three to six months followed by a variable period of on-the-job training. No grades are given and no certificate is earned. Health workers receive one month of formal training with continuing on-the-job supervised training. The Red Guard workers receive only 10 days of formal training, after which they work closely with the physician in their health clinic. The brief initial training of these ancillary health workers is supplemented by an effective continuing medical education program. As the need arises for medical proficiency in a particular local medical health problem, the health workers return to the medical schools or hospitals for additional training.

Impact

It is probably too early to assess the full significance of the Cultural Revolution on the status of medicine and health care and especially on its future development. In some respects it has had little effect, while in others it has produced radical changes, the consequences of which are yet to be determined. In the realm of disease control there has probably been little effect, since most of the measures that had been initiated toward this purpose were implemented before the Cultural Revolution and have since been continued, perhaps with greater effort. But in the area of distribution of medical personnel, training of medical manpower, and medical research, it has undoubtedly produced some radical changes.

Particularly important among these changes was the provision of greater "consumer" representation in the policy and management of health-care programs and institutions. This is well expressed by the establishment of the "Revolutionary Committee," which consists of a tripartite representation, namely, the military, the cadre (Communist party members), and the masses. All medical institutions, from medical colleges and hospitals to the smallest rural health care unit, are directed by a Revolutionary Committee. Whereas the "leading member" of the committee (or chairman) is apparently appointed by government authorities and is a member of the Communist party, the other members are usually elected by the staff and by certain groups served by the institution, such as, for example, the workers in a factory or a commune. The Committee has considerable local authority in the management and implementation of the activities of the institution within certain limitations of policies and goals established by the Ministry of Health within the Central government and by the various Bureaus of Health of the regional area in which the institution is located. In this respect there is considerable delegation of responsibility and authority for implementation and operation of activities, and thus there is much regional variation in the methods of accomplishing their purposes. Within the local Committees open, frank, and often critical discussions take place concerning all aspects of the institution's activities, including those of a professional nature. The impression gained is that this has had the effect of breaking down social class distinctions and of giving the people the feeling of involvement, participation, and self-reliance, which is an important aspect of Chairman Mao's "thoughts."

Research

Another significant change produced by the Cultural Revolution was in the field of medical education and medical communication. To begin with, it resulted in the closing of virtually all medical schools and the suspension of medical publications. Indeed, most medical schools have been re-opened only within the past few years, with radical changes both in curriculum and period of training, as well as in selection of students, as previously described.

It is difficult to assess the full impact of these radical changes. In some respects it undoubtedly caused a setback in medical developments, since

there was no formal training of medical personnel at the highest professional level for several years. There was also little or no medical research and development, and no scientific publications appeared during this period.

In this connection medical research and the concept of freedom of inquiry as an integral function of medical schools has not yet been completely established following the restructuring that has taken place as a consequence of the Cultural Revolution. Although there is acknowledgement of the basic thesis that teaching, patient care, and research are mutually supportive and interdependent, the organizational structure of the medical school as a free-standing institution and separate establishment of categorical research institutes belies the functional integration of these activities. To be sure, in some medical schools there is a "department" for the administration and support of research and in some instances an intramural "institute for research," but research as a primary and major function is largely vested in separate institutes sponsored and supported by other governmental bureaus. The impression gained from discussions on this matter is that it is primarily directed research. It was also my impression that these changes have tended to jeopardize the productivity, creativity, and viability of research in medical schools and in turn to diminish the quality of medical education.

In discussions with some of the older, experienced, Western-trained medical people, who have been closely associated with medical education, one gets the impression that they have accepted and adjusted to these changes, that there was a need to stop and to "sum-up" the experience and to experiment with new methods designed for the basic medical needs of their people. The implication in the "need to experiment" may have been a polite way of saying the pendulum had swung too far from established principles of basic medical educational programs. My own belief is that in time the inherent pragmatic nature of the Chinese people will ultimately prevail and that with further time and experience, an effort will be made to re-establish in the curriculum a greater amount of time devoted to the teaching of basic scientific knowledge directed toward a higher quality of professional personnel. This is further suggested by the fact that there is now a resurgence in research and scientific inquiry which was virtually halted during the Cultural Revolution.

There is reason to believe that this new interest and flow of investigation will be rechanneled into the medical schools to provide encouragement and enhancement of medical research as an integral function and obligation of medical education.

Surgery

Among the more impressive developments in the current state of medicine in China is the emphasis being placed on the role of surgery. This is in striking contrast to the lowly and insignificant role it was accorded in the basic and philosophic concepts underlying the Chinese traditional system of medicine throughout the centuries. This earlier and somewhat disdainful role of surgery has been attributed to several factors, including particularly reverence for the human body, an essential component of Chinese culture, and the Confucian doctrine with its emphasis on filial piety and ancestor worship. As stated by Stephan Palos, "The standards of Confucius ensure loyalty to the bonds of patriarchy and kinsmanship which unite the living and the dead. It was also a form of loyalty toward one's ancestors that the body which one had received from one's parents should not be mutilated but be returned to one's ancestors after death in a state of completeness." Accordingly, marring or mutilation of the body as a possible consequence of surgical intervention would violate these concepts. It was customary to bury with the body any amputated parts when this might have occurred. (One may wonder to what extent this cultural background may have influenced the recent emphasis upon restoration surgery directed toward reattachment of extremities amputated by trauma).

Few references are made to the practice of surgery in the extensive and voluminous ancient medical treatises. Surgery is only briefly mentioned, mainly for superficial procedures, such as scraping of ulcers, and only as a last resort in the Yellow Emperor's classic text of Internal Medicine. Other later references to surgical procedures, some of which could be considered major, are generally believed to be legendary. In some instances credible references are made to surgical treatment of trauma. It is interesting to observe that castration was considered an acceptable surgical procedure, but this was originally developed as a punitive measure. Later, it was used for preparing eunuchs as highly prized servants for the imperial courts. With one sweep of a sickle-shaped knife the penis, scrotum, and testes were amputated. Even

as late as 1793-94 during Lord Macartney's mission to China, Dr. Gilliam, who was a member of the mission, observed that surgery did not "exist" in China.

Buddhism

Although the spread of Buddhism to China had some influence on medical development, it was unable to penetrate the Confucian doctrine insofar as surgery was concerned. Whereas Buddhism was introduced to China earlier, it is generally assumed that its main spread among the populace began about the sixth century A.D. Fundamental to the Buddhist doctrine is the relief of suffering and universal kindness to all living things. Accordingly, Buddhist monks concerned themselves with the art of healing, and some were famous Indian doctors. Buddhist monks also featured in the history of Chinese medicine. In contrast to the Confucian doctrine, and even to those of Taoism, which assumed a more theoretical approach to medicine, the Buddhist monk-physicians took a more pragmatic approach to the art of healing and thus became more immediately relevant to the people. Thus, the spread of Buddhism to China brought certain cultural values as well as the knowledge of common methods of healing used in India. Despite the Buddhist influence, which undoubtedly enriched the development of Chinese medicine, it had little effect upon the development of surgery, owing to the dominant Confucian point of view, which strongly opposed "mutilation" of the body. Indian surgical methods and practical anatomic knowledge, which was advanced for that period, were thus precluded from the traditional Chinese art of healing.

The role of surgery in the historical development of medicine is sharply portrayed by contrasting its cultural and philosophic preclusion from Traditional Chinese medicine and its progressive acceptance in the Western cultures. To be sure, even in Western medicine the role of surgery was not always regarded highly and during some periods was disdained within the medical community (witness the barber surgeon period), but it was not precluded on a cultural and philosophical basis, and it ultimately assumed a respectable position and exerted a significant force in stimulating scientific inquiry leading to a more rational system of medical therapy.

The Missionaries

The long lag in the development of surgery in China persisted until the 19th century, when medical missionaries were allowed to enter the country. In 1835, Peter Parker, a medical missionary and a graduate of Yale Medical School, opened the Canton Ophthalmic Hospital and inaugurated Western surgery in China. His fame spread and patients flocked to his hospital. He operated on patients with cataracts, as well as other conditions, and was the first to use ether as an anesthetic in China. Subsequently, other medical and surgical missionaries established facilities for Western medical practice and were equally gratified by the response of the Chinese patients.

Western medical and surgical training was also brought to China by American and British missionary societies, which established and supported the Union Medical College in Peking. Later, an important development took place that led to the establishment of the first academic program in surgery comparable to that currently in operation in American medicine. This came about through the interest of Mr. John D. Rockefeller and his principal advisor, Reverend Fredrick T. Gates, who in 1909 suggested the financing of an Educational Commission to evaluate social, religious, and educational conditions in the Far East. They found that only about 400 students (about 1 per million population) were studying Western medicine in China and recommended that the Rockefeller Foundation sponsor a program in medical education in China which led to the purchase of the Union Medical College in Peking by the China Medical Board in 1915. Two years later the pre-medical school was opened, and the first medical students enrolled in the fall of 1919. A strong effort was made to establish standards comparable to the best in America, and a distinguished faculty was recruited from the United States. Residency programs in surgery, as well as other specialties, were developed, and a true academic program in Western medicine comparable in standards and quality to the best in the United States was thus established.

Quality and Standards

The impact of this important development is clearly reflected by the high standard and quality of surgery observed during my recent visit to China. To be sure, most of the surgeons whom I observed represented second and third generation products of this school of surgery, (largely of Halstedian influence), but it was obvious that their training was within this traditional framework (careful attention to the handling of tissues, meticulous control of bleeding points with minimal bleeding, and exclusive use of silk sutures and ligatures). It should be observed, however, that this generation of surgeons was not slavishly tied to all the characteristic features of the Halstedian school of surgery and had modified and improved the technical approaches in accordance with their inherent pragmatic nature. Particularly impressive also was the skillful and adept performance of the surgical procedure. I can truthfully say that all the surgical procedures I observed were performed in accordance with the highest standards anywhere.

The stark simplicity of the resources and facilities in the operating rooms are noteworthy. Sophisticated electronic monitoring devices, for example, so commonly used today in our operating rooms, are missing. Monitoring of the patient's condition is usually limited to a simple recording electrocardiograph and a blood pressure cuff, even in the performance of open heart surgery. Silk is used almost exclusively for sutures and ligatures. The instrument trays are also simple and limited to the most essential instruments. The operating room lights are of an earlier vintage. Despite these limitations by our standards in operating room resources, the surgical performance itself was of the highest quality, a fact which suggests that the ability of the surgeon is much more important than surgical facilities and resources.

The range and scope of surgical procedures being performed in China today are also impressive, and with certain exceptions, fairly comprehensive. Particularly noteworthy is the emphasis upon the surgical treatment of trauma. The organization and implementation of the emergency service established for trauma is equaled only by that observed in Russia. Great effort has been made to reduce the time between injury and treatment. This is well demonstrated by the successful results that have been obtained with reattachment of limbs that have been amputated by trauma. These patients are usually brought

to the centers for this purpose within a few hours after the injury with the amputated part having been cooled in the meantime to just above freezing. The establishment of burn centers with a team approach, and the great effort made to mobilize every resource and facility for this purpose, is another example of the excellence of the emergency organization. It is a further reflection of the underlying concepts of the health care system in China to deliver adequate health care to all citizens and especially to ordinary workers.

Although the cardiovascular surgery I observed was of high quality, there are some definite limitations in its scope. Surgical treatment of most forms of congenital heart disease is being undertaken, including those requiring the heart-lung machine. In the field of acquired heart disease, such as valvular heart disease and coronary occlusive disease, surgical treatment is not readily available, owing to limitation in resources. I saw many patients, for example, with severe forms of valvular heart disease, obviously requiring valvular replacement who were being treated only by medical measures. I was told that a few patients had been treated by valvular replacement before the Cultural Revolution but none since. They indicated, however, that they were working on the development of artificial valves for this purpose and hoped to start again with this work. I also saw many patients with coronary arterial occlusive disease who might be candidates for surgical treatment, such as bypass surgery, but this type of surgery is also not yet available. In this connection, facilities, resources, and organization of intensive coronary care units have not been well developed, but efforts are being made toward this purpose.

Acupuncture

Acupuncture, both as a therapeutic modality for various ills and as a method of anesthesia, has been one of the most widely publicized medical "breakthroughs" since heart transplantation. It has caught the fancy and imagination of both the news media and some Western-trained medical observers who have recently visited China. It has spread to Western Europe, Latin America, and more recently, the United States of America. Various attempts have been made by Western-trained medical observers to evaluate and interpret this ancient Chinese art of healing, but none has been entirely satisfactory, and it remains an enigmatic phenomenon.

Acupuncture is imbedded in the philosophical basis of Chinese Traditional medicine extending over a period of more than 3,000 years. Some scholars who have studied this subject state that evidence of the use of acupuncture may be found on bone etchings dating back to 1600 B.C. According to Palos and Felix Mann, the first mention of acupuncture is contained in a commentary entitled, "Tso Chuan," which is said to have been compiled by Tso Chin-ming, who lived between the fifth and third centuries, B.C. In one of the oldest medical documents on Chinese medicine, Huang Ti Nei Ching Su Wen (The Yellow Emperor's Classic of Internal Medicine) written about 200 B.C. and consisting of a collection of dialogues between the Yellow Emperor and his court physician, Chi Po, reference is made to acupuncture and other ancient medical practices. According to Dr. James U. P. Chen, acupuncture received major impetus during the T'Ang (618-907 A.D.) and Sung (960-1276 A.D.) dynasties, when the first illustrated acupuncture documents with anatomic drawings was evolved and the first bronzed statue with marked points was cast. In the Palace Museum in Peking I saw in one of the display cases showing various objects representing the Hsia dynasty (approximately 2,000 years ago) some rather crudely constructed acupuncture needles.

The basic Chinese medical and philosophical concepts include the doctrines of Yin-Yang and the Five Elements, the meridians, and the acupuncture points. Traditional Chinese medicine teaches that in a healthy body, the flow of Ch'i (the Energy of Life) should be free and uninterrupted. This vital force, which starts from the lungs and flows through the meridians in a certain order, is controlled by the interplay of two opposing forces, the Yin (negative, or night, cold, dark, female, and inside of the body) and Yang (positive, or day, heat, light, male, and outside of the body). Disease develops when these two forces are in imbalance. The Yin and Yang energy flows through the 12 basic organs and meridians. These are classified into Yin solid (Tsang) organs (liver, heart, spleen, lungs, kidney, and pericardium), which "store but do not transmit," and Yang hollow (Fu) organs (gallbladder, small intestine, stomach, large intestine, bladder, and tri-heaters*), which "transform but do not retain." One of these two opposites is constantly changing into the other; they are never static.

* Tri-heaters, or "triple warmer" refers to the cycle which controls an organ's chemical milieu, and is said to be the chief source of energy for the body. — Ed.

Deeply rooted in basic Chinese classical medical concepts is the doctrine of the Five Elements (Wood, Fire, Earth, Metal, and Water). These elements can work together in a creative cycle or can work against each other in a destructive cycle.

Each meridian has specific points corresponding to the Five Elements. The most important acupuncture points are those between the fingertips and the elbow and between the tips of the toes and the knees. Almost all diseases can be treated by appropriate use of these points in accordance with the doctrine of the Five Elements.

The arrangement of the Five Elements on the limbs is fundamental to that of the points of tonification and sedation. The point of tonification of the meridian and the element to be tonified is a "mother" point, and the point of sedation of the meridian and element to be sedated is a "son." This is known as the Mother-Son rule.

Traditional Chinese medicine theorizes that the body contains a network (Ching Lo or Meridians) of channels which are identified with the internal organs and the limbs and which connect the different parts of the body. The primary meridians are subdivided according to the course they traverse and the organs they influence. The three Yin Meridians of the arms run from the breast to the hand (lungs, heart, and pericardium), and the three Yang Meridians of the arms run from the hand to the face (large intestine, small intestine, and the tri-heaters). The three Yang Meridians of the legs run from the face to the foot (stomach, bladder, and gallbladder), and the three Yin Meridians of the legs run from the foot to the breast (spleen, kidneys, and liver). The length of each meridian and the number of significant points along each course vary widely. The meridian of the bladder is the longest, having 67 points, whereas the meridian of the heart has only 9 points. From experience certain general rules have been established concerning selection of the points to be used for the treatment of various diseases. Various charts show from 500 to 800 acupuncture points.

Traditional and Western Merge

These classic Chinese medical and philosophical concepts including the doctrine of Yin-Yang and the Five Elements are so foreign to Western medicine that they have been considered unscientific and generally dismissed as a form of witchcraft, superstition, placebo, and perhaps hypnosis. Indeed, with the introduction of scientific Western medicine in China at the beginning of the 20th century, the practices of Traditional medicine, including acupuncture, came under severe criticism by the new Western-trained physicians. This critical and somewhat disdainful attitude toward the traditional Chinese medical practices was prevalent until the mid-1960s and the Cultural Revolution, which successfully reaffirmed the authority of Chairman Mao Tse-tung and the national acceptance to implement his teachings and policies. This resulted in a radical change in the entire system of medical care and medical teaching, most important among which was the requirement to integrate Western medicine with Traditional Chinese medicine. From my own observations it seems clear that this national effort to merge the two systems of medicine is now well established and not merely politely or docilely accepted by the Western-trained physicians. The new curriculum in the medical schools not only includes modern scientific subjects, such as anatomy, physiology, and biochemistry, but exposes the students to the full range of Traditional medicine. In most of the hospitals, too, representatives of Traditional medicine are included on the staff, and trained acupuncturists were often observed as members of the Department of Anesthesiology, usually headed by a Western-trained physician specializing in anesthesiology.

Acupuncture Anesthesia

As I observed the current practice of acupuncture anesthesia, it would seem to differ from the classic description of its therapeutic application. For one thing, there are new points of insertion with use of fewer needles, and for another, the needle is constantly manipulated with a rapid up-and-down traverse of the needle over a distance of about one-half to three-quarters of an inch and simultaneous to-and-fro twirling of the needle by the thumb and fingers. These motions are maintained at a rate of about 120 cycles per minute. In other instances and as a substitute for the hand motion of the needles, (I was told that this was developed as a substitute for the hand motion for long operations that caused some physical exhaustion of the acupuncturist's hands) a small electric wire clip is attached to the shaft of each needle that is in turn connected to a small, direct-current battery power unit delivering about 9 volts at 110 to 150 cycles per minute. Preoperative medication of the patient varies somewhat from one institution to another, as also do the sites of insertion of the needles. The night before or on the morning of the operation the patient is often given some form of tranquilizer or sedative, such as meprobamate (Miltown) or a form of barbiturate. He may also receive an injection of morphine immediately before the operation. In some instances an intravenous drip of 5% dextrose to which may be added 50 mg of meperidine hydrochloride is given during the operation. In one of the operations that I observed on a patient with a ruptured sinus of Valsalva, whose heart was exposed through a median sternotomy, the surgeon infiltrated the skin and subcutaneous tissues with a local anesthetic before making the incision. In another patient, who had a right upper lobectomy, the surgeon infiltrated the mediastinal area with a local anesthetic. In all the other operative cases in which acupuncture was used that I observed, no additional form of local or general anesthetic was employed. All the patients seemed to tolerate the operation well and responded to questions.

It was interesting to observe the different sites of needling used in different institutions. For example, in one institution only one needle was inserted on the dorsum of the left forearm, whereas in another institution for a somewhat similar procedure the ventral aspect of the forearm was used. In still another institution, again for a somewhat similar operation, four needles were inserted in the right ear. In this institution, this same method of needling was used for three different types of operative procedures. One could not help getting the impression that the actual site of needling was not particularly important, since the same type of operation could be done whether the needle was inserted in the front or back of the forearm or in the ear, or whether one or four needles were used. When we asked how the acupuncture sites were chosen, we were told that in recent years through research and experience new locations from the traditionally established meridian points were being identified, and it had been found that the number of needles required could be reduced. The impression gained was that different institutions were trying different methods. In discussing with, and questioning, the anesthesiologists in the various institutions I visited, I made several observations. For one thing, acupuncture anesthesia is not the predominant form of anesthesia

used in surgical procedures. Indeed, it is used only in from 10% to at most 30% of cases. Local, spinal, and general anesthetics are used in most cases. For another, it is used under fairly strict guidelines. Thus, the temperament and general condition of the patient are important. The surgeon and the anesthesiologist, in consultation with the patient, make the decision to use acupuncture anesthesia. The patient is thoroughly briefed about the procedure and even may be shown movies of the actual operation during the briefing and preparatory session. The patient's full acceptance and enthusiasm for this type of anesthesia is essential. An anxious, tense, or frightened patient is considered an unsuitable candidate. Patients with certain types of disease, such as excessive pulmonary congestion or secretions, are also considered unsuitable. Moreover, patients requiring major abdominal operations are not considered good candidates because of the difficulty of obtaining muscle relaxation and because of the frequent discomfort to the patient caused by traction on the peritoneum.

When asked how acupuncture anesthesia works, the Chinese could give us no satisfactory explanation based on modern scientific knowledge. Most of those I interviewed indicted their conviction that in properly selected cases it does work. Some indicated that before their experience with it, they had been skeptical, but experience over a period of more than five years and with thousands of cases had clearly demonstrated its value and usefulness. Several schools of thought have developed regarding its mechanism, including neural pathways, traditional channels as originally described, and the "Gate Control" theory. Clinical and experimental research are being conducted in a number of institutions in an effort to obtain a better understanding of the mechanism, particularly in relation to contemporary medical scientific knowledge.

Interesting Theory

One of the most interesting theories concerns the flow of impulses through vigorous stimulation along proprioceptive pathways producing competitive inhibition of the transmission and perception of pain impulses from cutaneous receptors. It is believed that this competitive inhibition of blocking effect occurs both in the spinal cord through internuncial neurons and at the thalamic level in the brain in the centromedian and perifascicular nuclei. This is supported by certain histologic studies suggesting that major acupuncture points are located near concentrated clusters of proprioceptors. This is somewhat negated by the fact that there are few proprioceptors in the ear, which is a

commonly used acupuncture site. Much of this work has not yet been published, but a number of interesting experimental observations had been made in animals. I was told, for example, that acupuncture had produced sleep pattern electroencephalograms in certain animals, that in rabbits in which increased "induction voltage" in the cerebral cortex had been produced by peripheral pain, stimuli could be significantly lowered by acupuncture. These observations suggest that acupuncture anesthesia affected the amount of pain stimuli reaching the brain.

The impression gained from the various discussions I had about acupuncture anesthesia was one of considerable modesty among the anesthesiologists both in regard to their experience and to their advocacy of its application. They made it clear that they were still in the process of learning, and that although it was useful and had distinct advantages in certain selected cases, they still used conventioanl forms of anesthetization, both local and general, in most cases. They believed that with further research its mechanism and the most effective and precise manner of its application would be better understood.

In my own assessment of what I observed, I could not help recall my own experience with the use of local anesthetics for major surgical procedures. I can remember that during my surgical fellowship in Europe in 1936 local anesthetic was used predominantly for major operations. Actually, it is often possible simply to infiltrate the skin and subcutaneous tissue in order to block pain stimuli in the skin, and once the skin incision is made, there is little pain from deeper manipulation except in the abdomen, when traction is placed on the peritoneum. Even here pain stimuli can be blocked by infiltrating a local anesthetic in the root of the peritoneal structures. I can also recall, on my first visit to Russia, observing several thoracic operations successfully performed under local anesthesia. Interestingly, this practice in Russia has virtually disappeared in recent years with the development and widespread training of general anesthesiologists. Thus, the fact that major operations could be performed under acupuncture anesthesia was not particularly surprising once the incision was made through the skin. On the other hand, it was impressive to observe the skin incision being made without evidence of pain on the part of the patient (I watched the faces of the patients while this was being done and saw no evidence of flinching except on one occasion). In two patients local infiltration anesthesia was used to supplement the acupuncture anesthesia and in one of these before the incision was made. Another possibly important factor in its

successful application is the long historical background in Chinese culture of widespread acceptance of Traditional Chinese medicine and acupuncture as a therapeutic modality. Along this same line it is difficult to assess the rate of ideological indoctrination and Chinese stoicism in its successful application. The fact remains that it is being widely used with a high degree of success (in most institutions I visited I was given success rates ranging from 85% to 95%), albeit in selected cases and for no more than 10% to 30% of the surgical cases. Only time and experience will determine whether it will prove to be a medical "breakthrough" for anesthesia. So far as Western surgical practice is concerned, I seriously doubt that it will have a significant impact in the immediate future.

Epilogue

My visit to China, albeit brief, was truly one of the most memorable and exciting experiences I have ever had in my extensive travels to foreign lands around the world. The organization of the Chinese health care system, the way in which it was implemented within a short time despite the shattering social upheaval that occurred during the Cultural Revolution, and the extraordinary results they have achieved with limited resources are indeed a magnificent tribute to the dedication of the Chinese medical leaders and to the altruism and industry of the health workers. It is an inspiration to see the devotion and compassion with which all levels of medical personnel attend to the health needs of the masses. To what extent this is the result of the deification of Chairman Mao and the dissemination of his idealistic "thoughts" in order to instill in the people a feeling of self-reliance and inspire them to serve the masses, and to what extent this can be attributed to the disciplined sense of national purpose that has apparently been engendered in the populace is difficult to assess.

I was deeply impressed with the warmth, friendliness, and forthrightness of all the people whom I met. Everywhere we went we were accorded a genuinely cordial and hospitable reception. The people were honest in their explanations to us about what they were trying to do and the progress they had made, as well as the problems they have yet to solve. Their great desire to improve the welfare of all people was reflected by their frequent requests that we make constructive criticisms and suggest means of improving their methods and procedures.

A Spartan Society

The Chinese are a fascinating study in quiet dignity, obedience, self-discipline, and purposive self-confidence. They go about their duties with a fanatic fervor and apparent genuine pleasure. Their morals are puritanical. Not only do they manifest no overt interest in sex, but they are shocked when the word is mentioned. We were told that there is little if any premarital or extramarital sex. The women have nice figures and pretty hair, but they exhibit little or no interest in fashions. Rather, like the men most of them wear the inexpensive, drab, loose blouses and trousers, and they either braid their hair or wear it in a simple short bob. In this connection, I could not help recalling my observations in Russia during my periodic visits over the past 15 years. In contrast with my earlier visits when I observed a similar lack of interest in fashion among the women, in recent years they have shown an increasing interest in fashion, wearing more attractive dresses, shoes, and make-up. Hair dressing establishments for women have become common, and even mini-skirts are worn by young girls. I could not help wondering if this same change in women's fashionability would not also ultimately take place in China.

Basically an agrarian people, the Chinese are extremely industrious, the men and women working side by side in the fields and factories, toward a common purpose — to build a better country for themselves. You do not see beggars on the street, and no one will accept a tip. They live simple, Spartan lives. The homes we visited contained only the bare essentials, but they were immaculate. There are no privately owned automobiles. On the streets one sees mostly buses, trucks, and horse-drawn carts. But during the early morning and late afternoon hours the streets are crowded with bicycles. In Peking we were told that there are almost 2 million bicycles. They are not only used for individual locomotion but also for a variety of transport including, with certain modifications, carrying children and members of the family, as small trucks carrying huge loads of sacks of grain, pigs, fresh cut grass, and tree branches, and sometimes carrying trailers loaded with a wide variety of material.

The people in general appeared healthy, happy, well fed, and satisfied. Their basic economic security probably accounts for their cheerfulness and willingness to become involved in whatever they are asked to do.

East-West Rapport

I was particularly proud to hear of the highly favorable impression that President and Mrs. Richard Nixon had made on them during their unprecedented trip to China in 1972. Unquestionably, this truly historic event initiated the new climate of warm friendship with America that we encountered, and their sincere desire to improve and strengthen our interchange. My observations augur well for President Nixon's hope that a new era has been inaugurated for a "generation of peace and constructive development for mankind."

As my plane lifted its wings to take off from the Peking Airport, I could not help thinking that probably in no other country in the world would a large delegation of physicians come to the airport late at night to meet a plane, bid a friend farewell, and wish him a safe journey home. This parting gesture of genuine friendliness tells more about the character of these remarkable people than any verbal description I can give.

FINIS

GLOSSARY

ANASTOMOSIS	a joining together of parts, as blood vessels, to allow communication or flow between them.
ANGIOGRAPHY	X-ray visualization of blood vessels.
ANOXIA	lack of oxygen.
ANTERIOR	in front of, or in the front part of; toward the head.
ATRIAL	of or pertaining to one of the two atriums or upper chambers of the heart.
AURICULAR	of or pertaining to the ear.
BILLROTH I	a surgical procedure for stomach ulcer or sometimes, cancer.
BIOLOGIC DRUGS	(or biologicals) medicinal preparations made from the products of live organisms, or sometimes the organisms themselves.
BLOOD GAS	the oxygen, carbon dioxide, or other gas normally present in the blood.
BRONCHOGRAM	an X-ray film showing the bronchial tubes.
BRONCHUS	a bronchial tube.
BYPASS GRAFT	a vein taken from a patient, or an artificial tube of comparative size, sewn above and below a blocked segment of artery to permit free flow of blood into the artery beyond the blocked segment.
cm	abbreviation for centimeter or one-hundredth part of a meter. (See meter.)
CANNULA	a rubber or plastic tube containing a hollow, sharp-pointed instrument; used for insertion into an organ.
CARDIAC	of or pertaining to the heart.
CARDIOGENIC	originating in the heart.
CARDIOPULMONARY BYPASS	a machine which substitutes for the heart and lungs during some types of heart surgery.

CARDIOVASCULAR	pertaining to the heart and its blood vessels.
CARDIOVERSION	the act of causing an abnormal heartbeat to become normal.
CATHETER	one of a variety of rubber or plastic tubes used for insertion into a hollow body organ or blood vessel to facilitate infusion or drainage.
cc	cubic centimeter; equal roughly to one drop of water.
CENTROMEDIAN NUCLEI	structures in the thalamic portion of the brain.
COARCTATION	a stricture or contraction of the aorta, usually of congenital origin.
COMMINUTED	broken or crushed into small pieces.
COMMISSUROTOMY	an operation to increase the size of the opening of a heart valve which has been constricted by disease.
DACRON GRAFTS	plastic tubes used as substitutes for impaired or surgically removed portions of arteries.
DEXTROSE	a white powder obtained from starch. Dissolved in sterile water, it is injected or infused into the body through a vein as a nutrient.
DIASTOLIC	pertaining to the relaxed or dilated (diastole) phase of the heartbeat. (See systolic.)
DORSUM	the back part of a body structure.
DRAPES	the sterile cloths used to cover all of the patient during operation except the part to be operated upon.
DUODENAL	of or pertaining to the duodenum, the first part of the small intestine.
ELECTROENCEPHALOGRAM	a recording on paper of the electric currents produced by the brain.
ELECTROLYTE	a solution in body fluids which conducts electricity by means of its ions.
EPIDEMIOLOGIC	pertaining to epidemiology, or the determining of the many factors associated with the distribution and frequency of diseases in a geographic area.

EXCISION	a cutting away or cutting out.
EXTRADURAL	external to the outermost membrane covering the brain.
FELDSCHER	in Russia and some other European countries, a medical assistant not fully qualified to practice as a doctor.
FEMORAL ARTERY	a large artery in the thigh.
FIBRILLATION	squirming or nonproductive movements of the heart.
GASTRECTOMY	the surgical removal of all or part of the stomach.
GIANT CELL	a very large body cell, frequently one having several nuclei. (See nucleus.)
GIGLI'S SAW	a saw-toothed wire used in bone surgery.
GLUCOSE	a syrup-like liquid obtained from starch, (see dextrose) plus other nutrient additives.
HALSTEDIAN	of or pertaining to William Stewart Halsted, M.D., noted Baltimore surgeon and teacher.
Hg.	chemical symbol for hydrargyrum, or mercury.
HILAR	pertaining to a hilum or hilus, which see.
HILUM	or hilus (pl, hila) a depression in an organ marking the point of entry into the organ of blood vessels and nerves.
HISTOLOGY	the branch of anatomical study which deals with the very detailed structure of body tissues and their function.
HOMOGRAFT	tissue or a body part taken from a person or an animal of the same species and used to replace a similar but damaged part of another animal or person.
INFARCTION	pertaining to an infarct, an area of dead tissue.
INFERIOR VENA CAVA	the large vein through which blood from the veins below the neck enters the heart. (See superior vena cava.)

INTRAMEDULLARY NAIL	a surgical nail driven into the marrow of the bone and used to hold together the ends of a broken bone.
INTRAVENOUS	into a vein.
INTERCOSTAL	between the ribs.
INTERNUNCIAL NEURON	a nerve cell situated between one which conducts received impulses to their target, and another which receives the impulses and transmits them to a muscle.
INTERSPACE	anatomical space between two similar structures, as the spaces between the ribs.
ISCHEMIC	characterized by greatly reduced or absent blood supply.
KIRSCHNER WIRE	steel wire inserted into a bone.
LIGATION	a tying off with thread or wire.
LOBECTOMY	surgical removal of a lobe of an organ.
LUMBAR	the small of the back.
LUMINAL	a phenobarbital preparation.
MATERIA MEDICA	the study of the preparations, uses, and sources of drugs; a volume or listing containing such information.
MEDIASTINUM	the organs in the chest separating the lungs.
MEPERIDINE HYDROCHLORIDE	a narcotic analgesic.
METER	a unit of linear measure equal to approximately 39.37 inches.
MIDFEMUR	midway on the thigh bone.
MITRAL	of or pertaining to the mitral valve of the heart, so-called from its resemblance to a bishop's mitre.
mm	abbreviation for millimeter; one-thousandth of a meter. (See meter.)
MYOCARDIAL	of or pertaining to the myocardium or heart muscle.

NUCLEI	plural of nucleus.
NUCLEUS	a small round, important constituent of a body cell.
NEURON	a nerve cell.
PARAMEDICAL	of or pertaining to those who or that which assists a physician or surgeon; usually pertaining to a person working in the medical field but who does not possess a medical degree.
PERICARDIUM	the membranous sac enclosing the heart.
PERIFASICULAR	surrounding a bundle of nerves or muscles.
PERITONEUM	the lining of the walls of the abdomen and pelvis and covering the intestines.
PHARMACOLOGIST	a specialist in the study of drugs.
PLACEBO	a harmless substance sometimes given in place of a drug.
PLEURAL CAVITY	the space in the chest formed by the membrane which encloses the lungs and lines the inner wall of the chest.
PNEUMONECTOMY	surgical removal of lung tissue.
PROPRICOCEPTIVE	pertaining to stimulation received by internal body tissues.
PROSTHESIS	an artificial body part.
RESECTION	surgical removal of a substantial part of a body structure.
ROENTGENGRAM	an X-ray film showing an internal body part.
SEPTAL	of or pertaining to a septum or structure dividing an organ.
SINUS RHYTHM	normal heartbeat.
SINUS OF VALSALVA	small, normally occurring dilation of the aorta.
SMITH-PETERS NAIL	a flanged surgical nail used in fractures of the head of the thigh bone.
STERNUM	the breastbone.

STOMATOLOGIST	a specialist in the treatment of diseases of the mouth.
SUBCUTANEOUS	under the skin.
SUMP	a tube within a tube, used as a drain in surgery.
SUPERIOR VENA CAVA	the large vein which conducts the blood from the head and neck to the heart. (See inferior vena cava.)
SUPINE	lying on the back, with the face upward.
SYSTOLIC	of or pertaining to the contracted or squeezing phase of the heartbeat, or systole. (See diastolic.)
TETRALOGY OF FALLOT	a congenital heart condition in which four defects are present (often referred to as "blue baby").
THALAMIC	of or pertaining to the thalamus, or mid-portion of the brain.
THERAPEUTIC DRUGS	medicinal preparations.
THORACOTOMY	surgical incision into the chest wall.
TIBIA	the shin bone.
THORACIC	of or pertaining to the chest.
THYROIDECTOMY	surgical removal of the thyroid gland.
TRANSECTION	a cutting across.
TRAUMA	injury.
TRIGEMINAL	of or pertaining to the trigeminal or fifth cranial nerve.
VALVULOTOMY	surgical incision of a valve, as of the heart.
VENTRAL	toward the belly; of the arm, the inner aspect.
VENTRICULAR	of or pertaining to one of the two lower chambers of the heart.
WASSERMAN TEST	a test for venereal disease.